



United States Department of the Interior

FISH AND WILDLIFE SERVICE
FEDERAL BUILDING, FORT SNELLING
TWIN CITIES, MINNESOTA 55111

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JUN 10 1991

OTTAWA NATIONAL WILDLIFE REFUGE
OAK HARBOR OHIO

JUN 06 1991

Memorandum

To: Refuge Manager, Ottawa National Wildlife Refuge
From: Wildlife Associate Manager 2
Subject: Annual Water Management Program

Your Annual Water Management Program has been approved as written. Your charts and graphs clearly documents the response of waterfowl/wildlife and vegetation to the actual water levels obtained.

There is a slight alignment problem with your #7., Vegetation table. The years need to be shifted to the left. I'm sure this will be corrected in next year's submission.

I would like to know the results of the helicopter spraying of Rodeo?

Thanks for the good job.

for: William H. Kerschbaum
Matthias A. Kerschbaum

OTTAWA NATIONAL WILDLIFE REFUGE COMPLEX

ANNUAL WATER MANAGEMENT PROGRAM

REVIEW AND APPROVAL

Prepared by	<u>Chas W Blair</u>	Date	<u>4-15-91</u>
Reviewed By:	<u>/s/ James P. Mattsson</u>	Date	<u>5-16-91</u>
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Reviewed By:	<u>/s/ John V. Ramsour</u>	Date	<u>5-24-91</u>
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Reviewed By:	<u>William H Hutchison</u>	Date	<u>6/3/91</u>
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Approved By:	<u>William H Hutchison</u>	Date	<u>6/3/91</u>
	Wildlife Associate Manager 2 (WAM2)	Date	<u>6/3/91</u>

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OTTAWA NATIONAL WILDLIFE REFUGE COMPLEX

(OTTAWA NWR, CEDAR POINT NWR, DARBY DIVISION, NAVARRE DIVISION)

OAK HARBOR, OHIO

1991 ANNUAL WATER MANAGEMENT PROGRAM

NATIONAL WILDLIFE REFUGE SYSTEM
FISH AND WILDLIFE SERVICE
U.S. DEPARTMENT OF THE INTERIOR

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1991 WATER MANAGEMENT PLAN

This annual water management program provides guidelines for water levels during rehabilitation of moist soil units, after two years of major dike renovation, and continued warm temperatures.

It is important to note that in the past most of Ottawa's management capabilities revolve around gravity drainage. In the mid to late 1970's, energy conservation was a factor in the design of water control structures. Dual flap gates on screw gates that faced in opposite directions were installed. Gravity was all the energy needed and the system worked well during those years. The key was to have a water source that periodically fluctuated and wind tides on Lake Erie cooperated with each blow from the southwest and northeast.

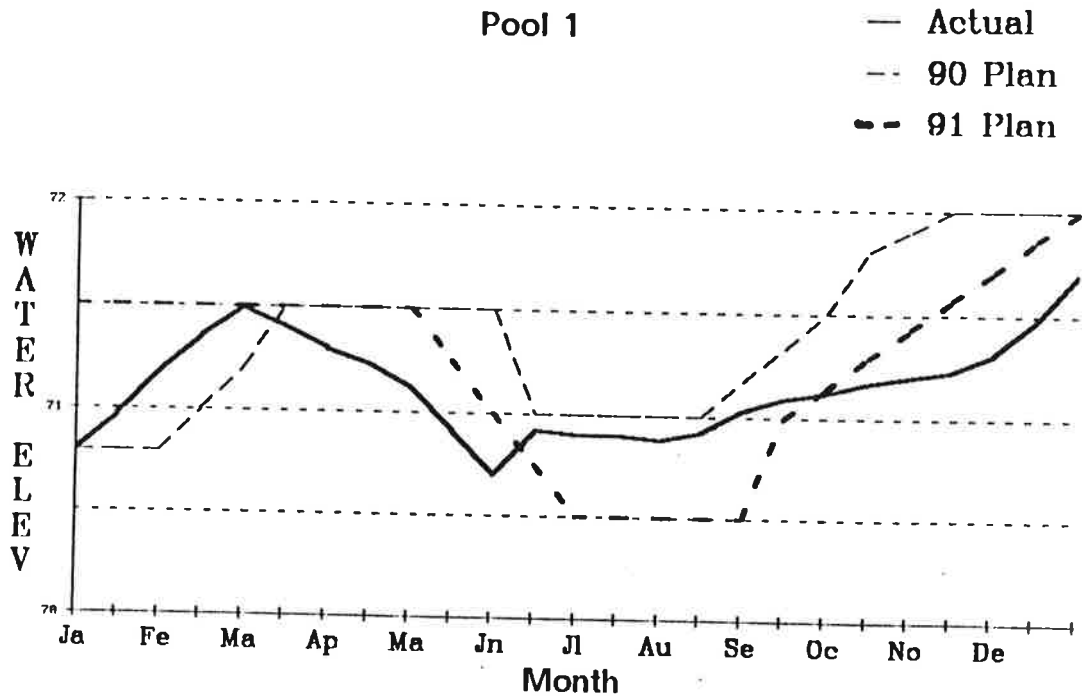
With record high water levels set in 1985, 1986 and early 1987, gravity control structures were no longer adequate. High water levels in pools could not be relieved without a major cost in money and human effort to pump it out with portable Crisafulli pumps. Severe erosion took place on all unprotected dikes. Defects in dikes caused by woodchuck and muskrat became evident. Carp find these dike leaks and can wallow out several feet of dike. Faulty water control structures became more serious as the pressure from high water tested their utility. Hundreds of acres of emergent vegetation drowned due to the inability to gravity drain in the high water years. Decreased water levels in mid 1987 permitted adequate drainage to relieve pressure on the dikes.

Since 1989 new pumps were put in place to enable the manager to manipulate water levels without having to rely on gravity drainage. Units which were affected by installation of pumps are those units directly influenced; Mini Marsh, MS 7a, MS 8a, farm field south of Velar Road, Cedar Point Pool 1, and units indirectly influenced; Pool 2a, 2b, 2c, MS 7b, MS 8a, Darby Pool 2 and 3, Cedar Point Pool 2. This will greatly enhance the program. The main Moist Soil pump at Ottawa NWR is located on the junction of County Line and Stange Rd. This pump enables manipulation of MS 3, MS 4, and MS 5. The pump was rehabilitated in 1989 due to major malfunctions.

By the summer of 1990, all construction under the flood damage funding was completed. Construction is being planned in MS-6, MS-8A, the Cedar Point Pheasant Farm, and possibly Darby Pool 4.

The station is in the process of writing a Wetland Management Plan. This plan should give more instruction on management for Ottawa as a whole including the major management goals such as spring migration, fall migration, brood habitat, and endangered species. The hopes are that future management will divide the refuge into core sections which will provide diverse habitat within a general area.

1. Unit Pool 1
2. Acres 275
3. Maximum elevation permissible 573
4. Flowline elevation of lowest structure 570.5
5. Water Elev. with 50% bottom exposed - 569
- 90% bottom exposed -



7. Vegetation:

Species	1988	1989	1990
Open Water	5	30	35
Cattail	15	25	20
Aquatic Smartweed	5	10	5
Smartweed/Nutsedge	65	20	15
Other	10	5	10
Willow/Mallow	10	15	

8. Wildlife Use:

	Use Days		
	1988	1989	1990
Ducks	93,700	80,000	101,010
Geese	44,000	15,500	44,490
GBH	3,300	3,000	6,450

9. Purple Loosestrife: Plants were found in the south interior part of the pool. Plants were pulled but not sprayed. Approximately 25 plants were pulled.

Pool 1

A.2 Effects of Past Year's Water Levels

Levels:

Water levels were at a shallow marsh level through out the spring. The unit had a open water area in the middle and moist soil area in the northern section. Construction on this pool was in August of 1989. Gates were opened to refill the pool. It was refilled by gravity slowly and lost some water to evaporation during the summer.

Results:

Submergent aquatics began to grow in the areas where water was standing. Other areas (especially the northern end) where, due to construction of the dikes, soil was disturbed were covered with smartweed. These conditions attracted shorebirds, geese and ducks. Approximately 25 Purple loosestrife plants were found in the southern end and pulled by hand and burned. The 6 - 12 inches of water in bay areas attracted average numbers of migrating waterfowl in the fall. Peak populations in the unit reached 5,000 birds.

Facilities:

The construction contract, which was awarded to the George Gradel Co. in March of 1988 to reconstruct the north and south dikes and replace the silted water control structure (WCS) on the southeast corner, was completed in August of 1989.

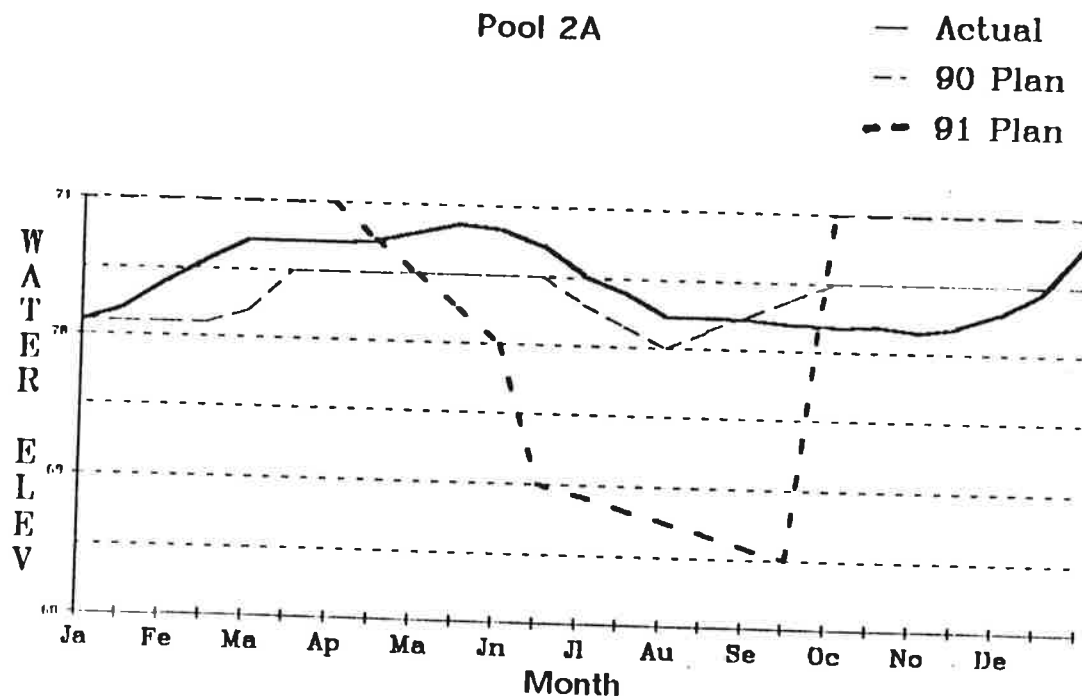
Costs:

No costs were incurred as only gravity was used to fill the pool.

B.2 Objectives of the 1991 Proposed Water Levels

Gradual increase in pool water level during the winter to return the unit to a permanent marsh, discouraging willow and cottonwood and encouraging normal marsh plants. Then a slight drawdown of water in the summer to encourage invertebrates. Water levels should be increase in the fall for migration purposes.

1. Unit Pool 2A
2. Acres 70
3. Maximum elevation permissible 572
4. Flowline elevation of lowest structure 569
5. Water Elev. with 50% bottom exposed - 568
- 90% bottom exposed -



7. Vegetation:

Species	%1988	%1989	%1990
<u>Open Water</u>	<u>10</u>	<u>40</u>	<u>55</u>
<u>Mixed Forbes/Other</u>	<u>35</u>	<u>25</u>	<u>10</u>
<u>Smartweed/Velvet Leaf</u>	<u>45</u>	<u>5</u>	<u>5</u>
<u>Aquatic Smartweed</u>	<u>0</u>	<u>15</u>	<u>10</u>
<u>Mudflats/Bidens</u>	<u>10</u>	<u>5</u>	<u>0</u>
<u>Willow/Cottonwood</u>	<u> </u>	<u>10</u>	<u>20</u>

8. Wildlife Use:

	Use Days		
	1988	1989	1990
<u>Ducks</u>	<u>51,300</u>	<u>41,900</u>	<u>31,740</u>
<u>Geese</u>	<u>39,800</u>	<u>47,400</u>	<u>67,500</u>
<u>GBH</u>	<u>1,000</u>	<u>800</u>	<u>240</u>

9. Purple Loosestrife: No plants were observed in this pool.

Pool 2A

A.2 Effects of Past Year's Water Levels

Levels:

Water levels were slightly above planned levels during the spring and below planned levels during the fall. Water levels in this pool are difficult to control as it only has one culvert which empties into an adjoining pool.

Results:

The pool did not hold a lot of attraction to wildlife during the year. A few smart weed plants were observed in the pool along with willow and cottonwood growth. The island in the middle of the pool is over grown with willow and cottonwood as well. Geese and a few ducks were observed loafing in the pool. The majority of the use seems to appear during the winter when open water is available in the pool.

Facilities:

The north, south and west dikes are in excellent condition. The east dike has some erosion problems at the toe. An extension was added to the current water gauge this year.

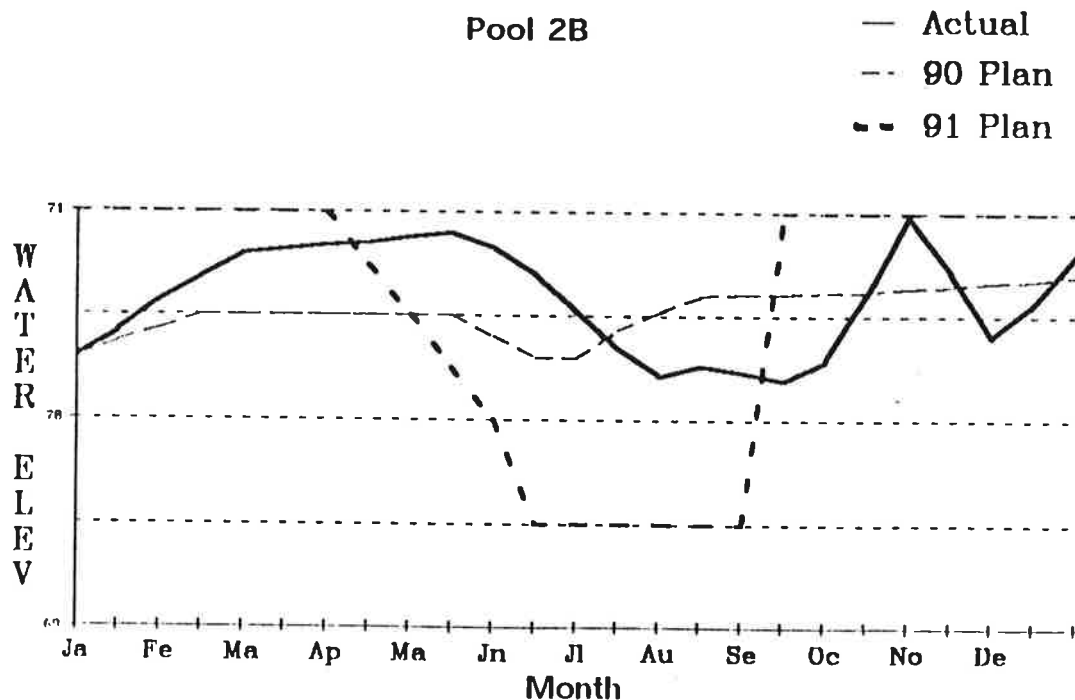
Costs:

The dikes were mowed once and the roads were graded. Purple loosestrife was not observed in this pool this year. No pumping was done in the pool.

B.2 Objectives of the 1991 Proposed Water Levels

This pool should be drawn down completely to encourage vegetation other than willow and cottonwood. The island in the pool should be cleared to provide nesting areas for geese and ducks. However, because of manpower limitations, it is expected that little will be done in this unit this year.

1. Unit Pool 2B
2. Acres 95
3. Maximum elevation permissible 572
4. Flowline elevation of lowest structure 570
5. Water Elev. with 50% bottom exposed - 568
- 90% bottom exposed -



7. Vegetation:

Species	1988	1989	1990
Cattail	3	3	3
Willow/Cottonwood	10	10	17
Smartweed/Millet	30	35	0
Open Water/Cottonwood Seed	47	10	20
Smartweed/Cottonwood Seed	5	10	40
Bidens/Milkweed/Other	10	10	0
Submerged aquatics		20	20
American Lotus		2	1

8. Wildlife Use:

	Use Days		
	1988	1989	1990
Ducks	47,100	45,000	36,090
Geese	22,300	37,800	73,170
GBH	1,600	1,400	930

9. Purple Loosestrife: No loosestrife visible.

Pool 2B

A.2 Effects of Past Year's Water Levels

Levels:

This pool was at a shallow marsh stage during the year. Water levels were slightly above planned levels in the spring and a natural depletion of water occurred in the summer due to evaporation.

Results:

Excellent stands of aquatic smartweed developed in the pool. One clump of cattail was evident. Submerged aquatics continued to develop in the entire pool. Cottonwood seedlings continue to grow especially at the east end of the pool.

Facilities:

The toe of the north and west dikes are eroded from past high water levels. A water level gauge was incorrectly placed in the NW barrow pit. It should cover the lower elevations not covered by the gauge on the Pool 2B/C WCS but it has disappeared since placement.

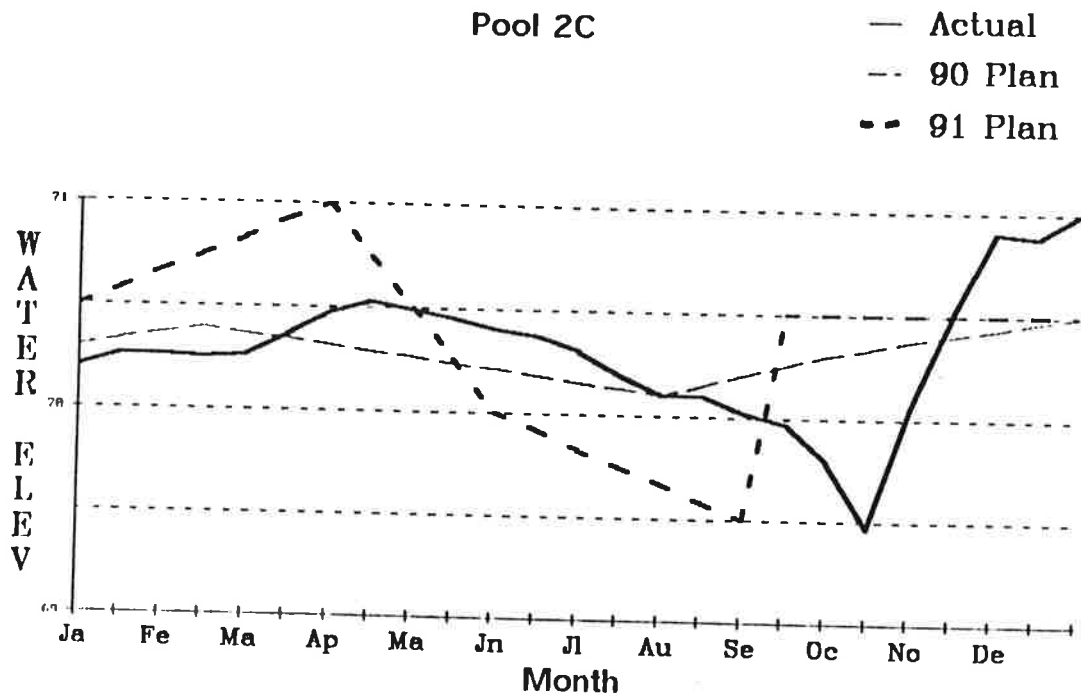
Costs:

The dikes were mowed once and the roads were graded. Several of the dikes were seeded to grasses.

B.2 Objectives of the 1991 Proposed Water Levels

Water levels should be lowered slightly during the growing season to encourage cattail growth.

1. Unit Pool 2C
2. Acres 80
3. Maximum elevation permissible 571
4. Flowline elevation of lowest structure 567
5. Water Elev. with 50% bottom exposed - 569
- 90% bottom exposed -



7. Vegetation:

Species	1988	1989	1990
Aquatic Smartweed	1	2	5
Smartweed	15	10	35
Millet/Other	34	25	3
Open Water/Submergents	45	40	16
Cattail	5	20	16
American Lotus		3	5
Mudflats			20

8. Wildlife Use:

	Use Days		
	1988	1989	1990
Ducks	55,000	49,900	66,720
Geese	24,400	45,000	29,190
GBH	1,900	2,000	1,920

9. Purple Loosestrife: No plants were observed.

Pool 2C

A.2 Effects of Past Year's Water Levels

Levels:

Water levels were allowed to fluctuate between 69.5 and 70.8. In the fall water levels dropped providing mudflats for migrating shorebirds and waterfowl.

Results:

This pool had a variety of emergents, moist soil plants and a few submergents. Lotus is continues to encroach in the middle of the pool. This was a favorite area for shorebirds and waterfowl during the fall.

Facilities:

The ground immediately around the Pool 2B/C WCS is eroding. A muskrat hole follows the culvert through the dike. Other dikes are in good shape. A new water level gauge was installed in 1988.

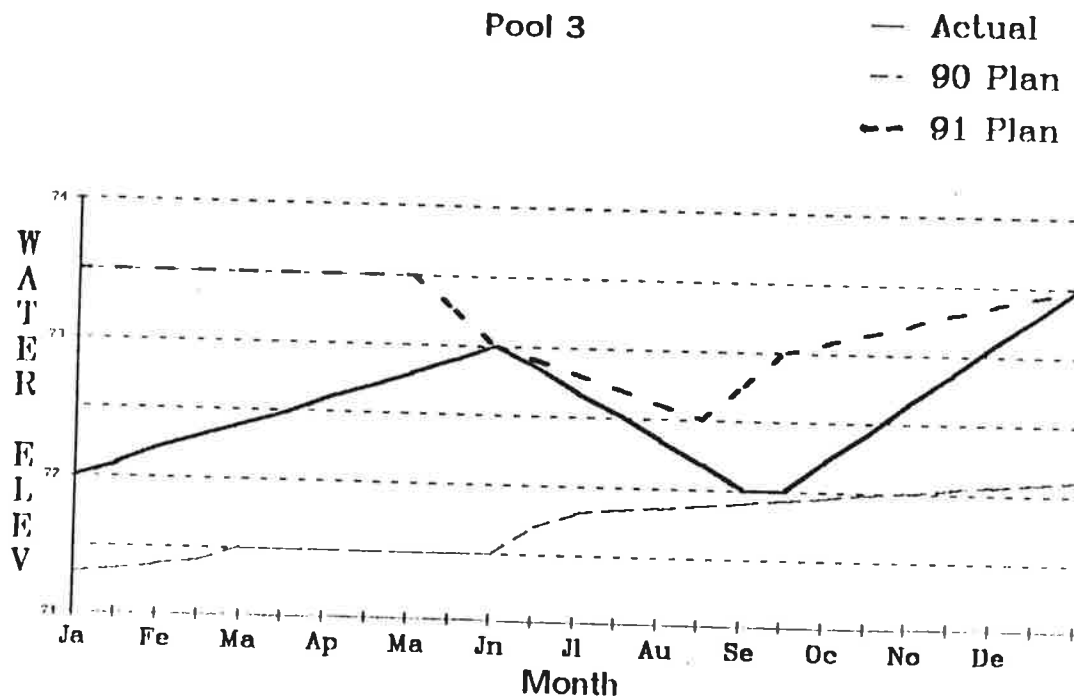
Costs:

The dikes were mowed once and the roads were graded.

B.2 Objectives of the 1991 Proposed Water Levels

Keep water levels at a shallow marsh stage throughout the year to encourage further growth of emergents and allow for submergent plant growth.

1. Unit Pool 3
2. Acres 260
3. Maximum elevation permissible 574
4. Flowline elevation of lowest structure 570
5. Water Elev. with 50% bottom exposed - 571.5
- 90% bottom exposed - 570.5



7. Vegetation:

Species	%1988	%1989	%1990
<u>Open Water/Mud Flats</u>	<u>50</u>	<u>50</u>	<u>40</u>
<u>Wooded</u>	<u>12</u>	<u>12</u>	<u>16</u>
<u>Cattail</u>	<u>12</u>	<u>12</u>	<u>23</u>
<u>Smartweed/Millet</u>	<u>25</u>	<u>15</u>	<u>18</u>
<u>Annual Smartweed</u>	<u>1</u>	<u>1</u>	<u>0</u>
<u>Submergents</u>		<u>10</u>	<u>3</u>

8. Wildlife Use:

	Use Days		
	1988	1989	1990
<u>Ducks</u>	<u>94,800</u>	<u>120,800</u>	<u>212,340</u>
<u>Geese</u>	<u>49,600</u>	<u>51,000</u>	<u>113,310</u>
<u>GBH</u>	<u>3,300</u>	<u>2,800</u>	<u>3,570</u>

9. Purple Loosestrife: Infestation along north dike. Plants pulled by hand in early July. 7.5 acres treated with a 5% solution of Rodeo (75 gallons solution) by helicopter. Phragmites treated with 30 gallons of solution on six acres (1% solution).

Pool 3

A.2 Effects of Past Year's Water Levels

Levels:

Water levels are now maintainable after construction was completed in August of 1989. Water levels dropped during the summer due to high evaporation and transpiration factors. In August and September the pool had only a few inches of water through out. In October the new water control structure was set to fill the pool. By December the pool had an additional 1 to 2 feet of water. "Actual" line indicated on the graph is an estimate due to lack of reliable water level gauge. A gauge is located in the southeast corner but it may have been moved through construction.

Results:

The pool was in a shallow marsh stage for most of the year. After the summer evaporation the unit was mostly mudflats where the water once was. In the fall the gate was opened to allow gravity to fill the pool. The east end of the pool was used heavily by geese, and ducks during fall migration as a loafing area. West end of the unit is still choked with cattail and brush.

Facilities:

Construction on the south dike was completed. A new water control structure was placed along the south dike in 1989. A water gauge is needed to more accurately manage the water levels.

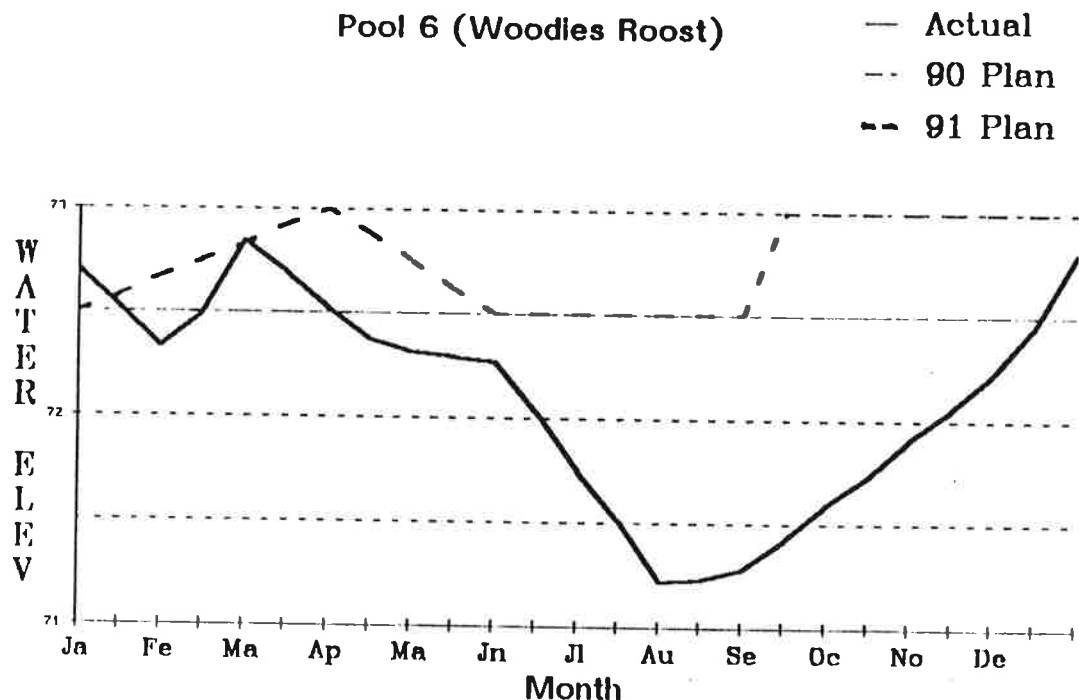
Costs:

The construction of the south dike and water control structure was included in the cost of the Tank Ditch project which cost \$ 12,046,617.14 and was covered by the Flood Damage monies. No costs incurred other than purple loosestrife spraying (see graph page).

B.2 Objectives of the 1991 Proposed Water Levels

Water levels need to be high in the west end to open up cattail and brush and low on the east end to encourage such growth. Unfortunately, this is impossible without a dividing dike and this should be considered in the future. For now, we can only try to maintain a steady water level.

1. Unit Pool 6 (Woodies Roost)
2. Acres 160
3. Maximum elevation permissible 573
4. Flowline elevation of lowest structure 569
5. Water Elev. with 50% bottom exposed - 570
- 90% bottom exposed -



7. Vegetation:

Species	%1988	%1989	%1990
Open Water	35	40	40
Wooded	10	10	10
Cattail	39	35	40
Smartweed/Millet	15	10	5
Aquatic Smartweed	1	5	5

8. Wildlife Use:

	Use Days		
	1988	1989	1990
Ducks	6,000	5,500	14,250
Geese	9,200	5,800	7,620
GBH	1,800	1,500	720

9. Purple Loosestrife: No plants were observed. 2.5 acres of brush were sprayed by helicopter.

Pool 6 (Woodies Roost)

A.2 Effects of Past Year's Water Levels

Levels:

The pool fluctuated along with the lake levels and evaporation rates.

Results:

Areas of dense cattail are still present. Area has limited use by geese, ducks, and herons. Muskrat dike damage continues to be a problem.

Facilities:

East and south dikes are no longer capable of retaining water. Both dikes are severely eroded in areas and are riddled with muskrat/woodchuck holes. The north half of the east dike is overgrown with sumac and dogwood and is barely wide enough to ride an ATV on. The north dike also has some erosion and muskrat hole problems.

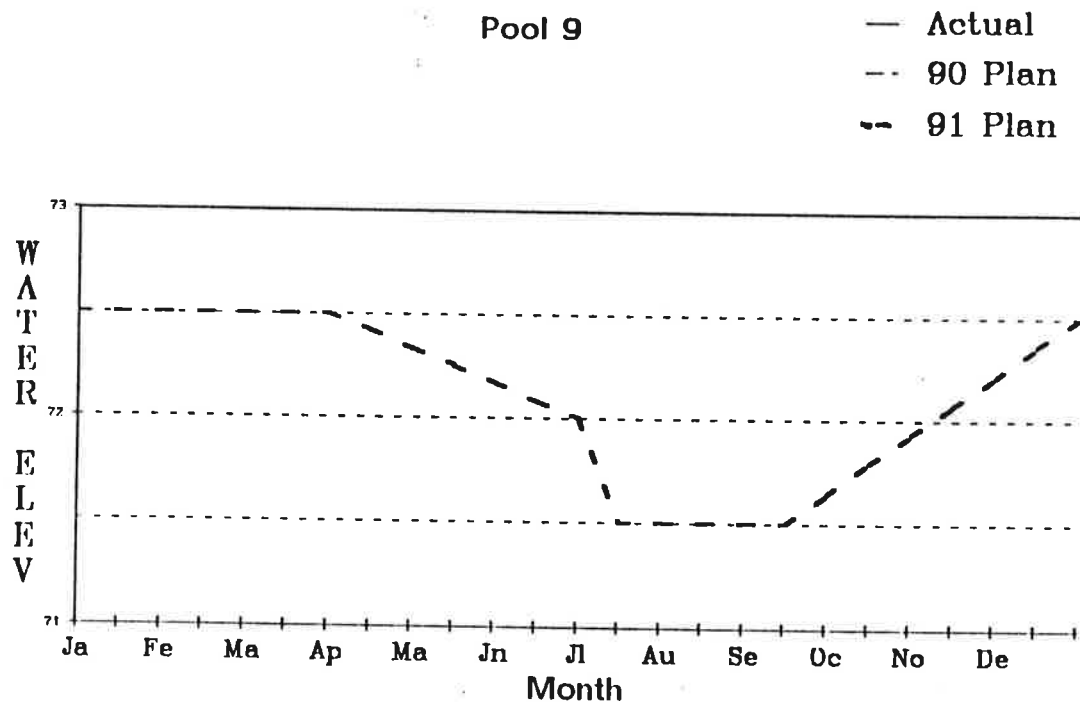
Costs:

None incurred.

B.2 Objectives of the 1991 Proposed Water Levels

Maintain current levels. The pool should hold water if the ODNR does not lower their adjacent unit. This unit is scheduled for renovations in the near future.

1. Unit Pool 9
2. Acres
3. Maximum elevation permissible
4. Flowline elevation of lowest structure
5. Water Elev. with 50% bottom exposed -
 90% bottom exposed -



7. Vegetation:

Species	1988	1989	1990
Cattail			76
Phragmites			10
Open water			4
Smartweed/mudflats			3
Cottonwood/willow			7

8. Wildlife Use:

	Use Days		
	1988	1989	1990
Ducks			7,320
Geese			810
GBH			810

9. Purple Loosestrife: Approximately 5 acres of loosestrife on the north end of the pool. Sprayed by helicopter with 50 gallons of Rodeo solution.

Pool 9

A.2 Effects of Past Year's Water Levels

Levels:

The pool was filled with water by gravity after the construction was completed. In the fall the pool was dewatered for the state to mow cattail on the east side of the unit and to allow access to install hunting blinds. The pool was then filled by gravity.

Results:

An area of dense cattail was mowed by the state. They also tried to seed the area for hunting but were unsuccessful. Cattail is still dense in other areas with patches of Phragmites. The back section of the pool has a large patch of Purple Loosestrife which was sprayed by helicopter this year. The area has limited use by geese, ducks, and herons. Muskrat dike damage continues to be a problem.

Facilities:

The north dike is eroded and riddled with muskrat/woodchuck holes and covered with trees and brush. It is scheduled for reconstruction along with Metzger's Marsh according to the North American Plan, St. Lawrence Project. The west dike also has some holes and brush on it. The south dike was reconstructed in the Tank Ditch contract in 1989. A water control structure was also placed in the southeast corner of the unit.

Costs:

No costs were incurred other than loosestrife spraying (see graph page).

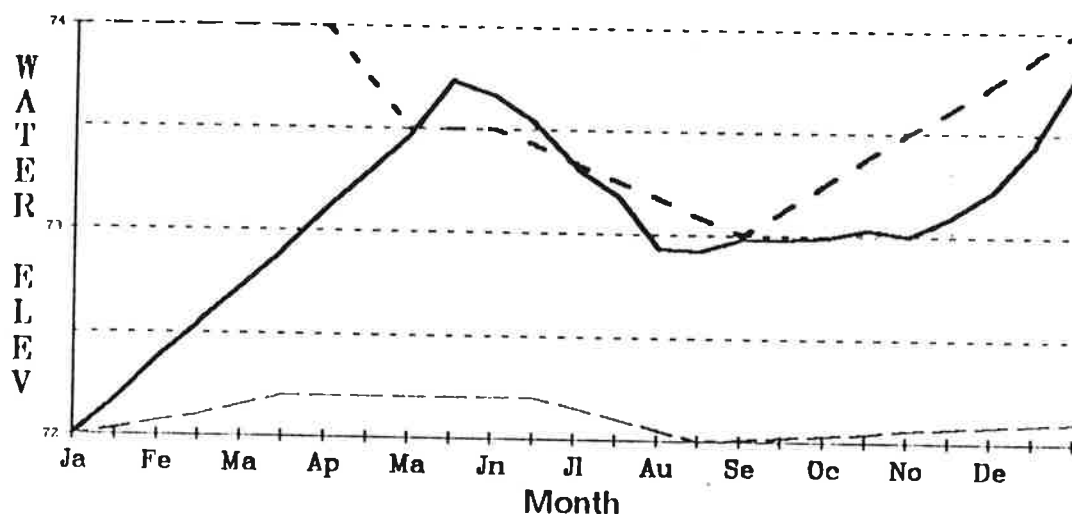
B.2 Objectives of the 1991 Proposed Water Levels

Once again the water should be kept as high as possible to discourage cattail. Other suggestions for setting back the cattail include burning and mowing if personnel are available. A staff gauge will be installed in the southeast corner near the water control structure so that accurate water level readings can be taken.

1. Unit Entrance (HQ) Pool
2. Acres 30
3. Maximum elevation permissible 572.5
4. Flowline elevation of lowest structure 569
5. Water Elev. with 50% bottom exposed - 570
- 90% bottom exposed -

Headquarters Pool

— Actual
 -- 90 Plan
 - - 91 Plan



7. Vegetation:

Species	%1988	%1989	%1990
<u>Open Water</u>	<u>10</u>	<u>10</u>	<u>20</u>
<u>Cattail</u>	<u>7</u>	<u>15</u>	<u>20</u>
<u>Wet Meadow</u>	<u>20</u>	<u>20</u>	<u>15</u>
<u>Smartweed</u>	<u>15</u>	<u>10</u>	<u>5</u>
<u>Willow/Brush</u>	<u>10</u>	<u>12</u>	<u>15</u>
<u>Upland</u>	<u>38</u>	<u>33</u>	<u>25</u>

8. Wildlife Use:

	Use Days		
	1988	1989	1990
<u>Ducks</u>	<u>2,200</u>	<u>5,600</u>	<u>34,620</u>
<u>Geese</u>	<u>5,800</u>	<u>6,500</u>	<u>31,110</u>
<u>GBH</u>	<u>600</u>	<u>1,300</u>	<u>1,200</u>

9. Purple Loosestrife: Large patches of loosestrife in the middle of the east side of the pool. 25 loosestrife plants pulled. Helicopter sprayed 175 gallons of Rodeo solution (17.5 acres) on loosestrife and brush in the pool.

Entrance Pool
(Headquarter's Pool)

A.2 Effects of Past Year's Water Levels

Levels:

Water was kept at a shallow to deep marsh level. Some water was lost through evaporation during the summer.

Results:

Young cattail began to grow in the pool. The pool was used extensively by ducks in the spring and fall and by Pied-billed grebes during the spring, summer and fall. Up to 13 young pied-bills were seen in the pool. Willow and cottonwood began to be stressed by the high water. In late July the willow, cottonwood and some Purple Loosestrife were sprayed by helicopter. Loosestrife was mostly found in the southeast section of the pool.

Facilities:

The north dike is in perfect shape after completion of the construction. A water level gauge was installed in the spring.

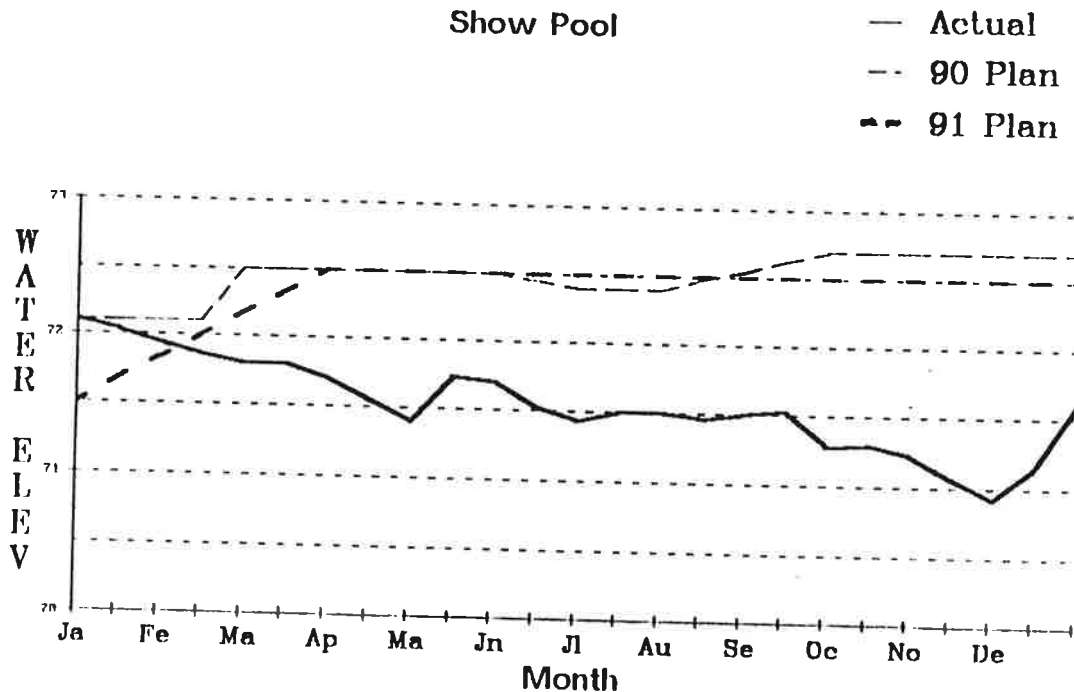
Costs:

No costs incurred other than purple loosestrife spraying (see graph page).

B.2 Objectives of the 1991 Proposed Water Levels

The unit should be kept at a normal marsh stage with a slight draw down in the summer. Steady water levels should be maintained to discourage the spread of Purple Loosestrife, to encourage cattails and other emergents, and discourage cottonwood and willow.

1. Unit Show Pool
2. Acres 30
3. Maximum elevation permissible 573.5
4. Flowline elevation of lowest structure 569
5. Water Elev. with 50% bottom exposed - 572
- 90% bottom exposed -



7. Vegetation:

Species	%1988	%1989	%1990
<u>Open Water</u>	<u>35</u>	<u>35</u>	<u>35</u>
<u>Cattail/Bulrush</u>	<u>10</u>	<u>15</u>	<u>20</u>
<u>Wet Meadow/Smartweed</u>	<u>30</u>	<u>10</u>	<u>15</u>
<u>Cottonwood</u>	<u>10</u>	<u>15</u>	<u>15</u>
<u>Submergents</u>	<u>0</u>	<u>10</u>	<u>5</u>
<u>Phragmites</u>	<u>15</u>	<u>15</u>	<u>10</u>

8. Wildlife Use:

	Use Days		
	1988	1989	1990
<u>Ducks</u>	<u>1,900</u>	<u>2,500</u>	<u>1,560</u>
<u>Geese</u>	<u>10,200</u>	<u>8,200</u>	<u>7,980</u>
<u>GBH</u>	<u>1,000</u>	<u>1,100</u>	<u>330</u>

9. Purple Loosestrife: Plants throughout the pool. Spotty all over with concentrations along the north interior dike and east edges. The helicopter sprayed 5 acres of loosestrife and Phragmites (50 gallons Rodeo solution). A backpack was also used to spray 2 acres of loosestrife (10 gallons of a 1% solution).

Shaw Pool

A.2 Effects of Past Year's Water Levels

Levels:

Water levels slowly decreased through out the year. In the summer it was mainly due to evaporation. There is also a slow leak in the south dike.

Results:

This pool has an island/remnant dike in the middle which most times is a moist meadow. The open water areas are devoid of any vegetative growth. Cattail, and Phragmites predominate with sections of loosestrife. Some smartweed grows amongst the cattail. Limited use by ducks, geese and great blue herons occurred.

Facilities:

The north and east dikes were totally redone in 1988-89. The south dike leaks into the wooded area around the shop and office. There are currently no plans for repair. The faulty water control structure was fixed in November 1988.

Costs:

60 gallons of Rodeo solution were used on loosestrife through out the pool by helicopter and backpack.

B.2 Objectives of the 1991 Proposed Water Levels

This pool is in need of major renovations with in the pool. If time and personnel are available, the unit should be drained, mowed and disked then water slowly added to encourage vegetative growth. If time is not available, maintain a high water level to discourage loosestrife Phragmites and willow/cottonwood.

9. Purple Loosestrife: None Noted.

Mini Marsh

A.2 Effects of Past Year's Water Levels

Levels:

Construction of the pump station was completed in 1989. Water was added to the unit after the dikes were completed mid-year. Water levels remained high especially during heavy flooding. Water level gauge is not present in this pool, as a result no water levels were taken.

Results:

Cattails dominated the pool along with open water after the pool was reflooded.

Facilities:

The north and east dikes were repaired this year but do not have a good grass cover. The south and west dikes are riddled with woodchuck and muskrat holes and are unsafe for walking.

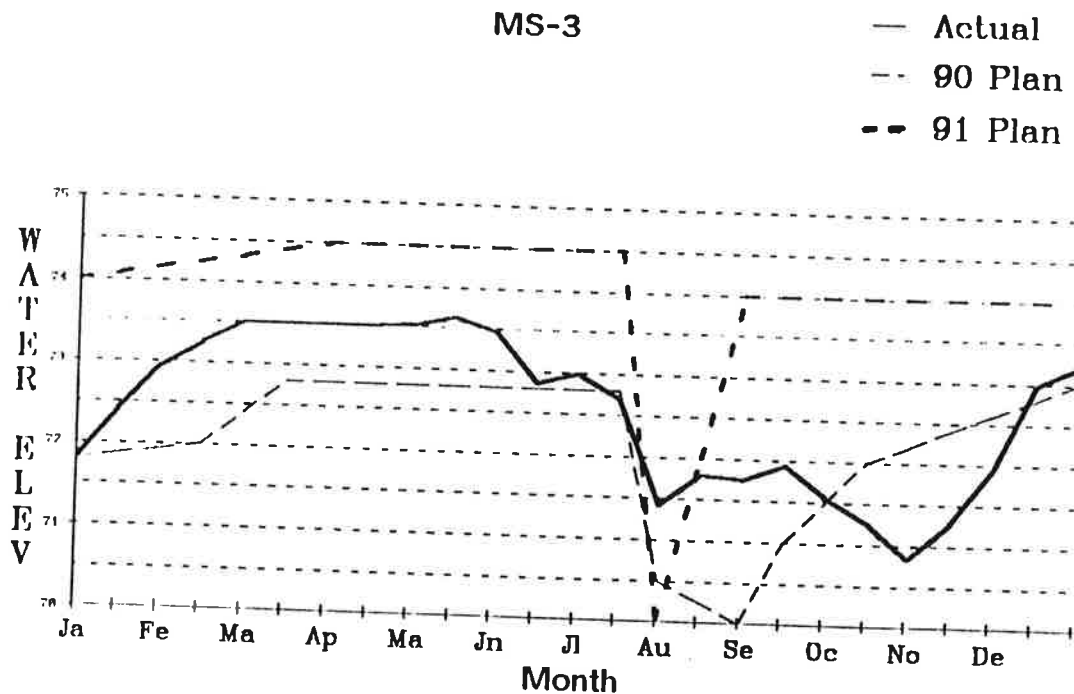
Costs:

Construction of pump structure was included in the Tank Ditch construction project.

B.2 Objectives of 1991 Proposed Water Levels

Lower water in spring to encourage growth and invertebrates, and to reduce dike erosion. If possible, add rip-rap to inside slope of dike, then fill slowly to counter summer evaporation then fill gradually to maintain 8 to 12 inches for waterfowl use in the fall. A water level gauge is needed to accurately manage this pool.

1. Unit MSU 3
2. Acres 213
3. Maximum elevation permissible 574.5
4. Flowline elevation of lowest structure 567
5. Water Elev. with 50% bottom exposed - 571.5
- 90% bottom exposed -



7. Vegetation:

Species	%1988	%1989	%1990
<u>Emergents</u>	<u>50</u>	<u>63</u>	<u>7</u>
<u>Open Water</u>	<u>10</u>	<u>2</u>	<u>2</u>
<u>Smartweed/Millet</u>	<u>20</u>	<u>10</u>	<u>6</u>
<u>Bidens/Cottonwood</u>	<u>5</u>	<u>15</u>	<u>40</u>
<u>Wet Meadow</u>	<u>15</u>	<u>10</u>	<u>5</u>
			<u>40</u>

8. Wildlife Use:

	Use Days		
	1988	1989	1990
<u>Ducks</u>	<u>97,300</u>	<u>32,000</u>	<u>21,120</u>
<u>Geese</u>	<u>79,000</u>	<u>55,000</u>	<u>3,630</u>
<u>GBH</u>	<u>2,300</u>	<u>1,000</u>	<u>1,470</u>

9. Purple Loosestrife: None observed.

MSU 3

A.2 Effects of Past Year's Water Levels

Levels:

Water levels were kept very low in this pool due to construction. Most of the unit had no water throughout the growing season. Water was added in late fall.

Results:

Low water levels encouraged upland species including willow, cottonwood, etc. Some millet was present but not much. Lack of water in the spring, summer and fall decrease duck and goose use on the area.

Facilities:

Placement of WCS, filter fabric, rip rap and topsoil was completed in 1989. Refuge staff continued to work on the west dike. The north portion of the dike was bulldozed to strengthen it, but more fill must be placed and sloping and rip rap done to finish it. The south dike is eroded at the toe, but is not scheduled for work in the near future.

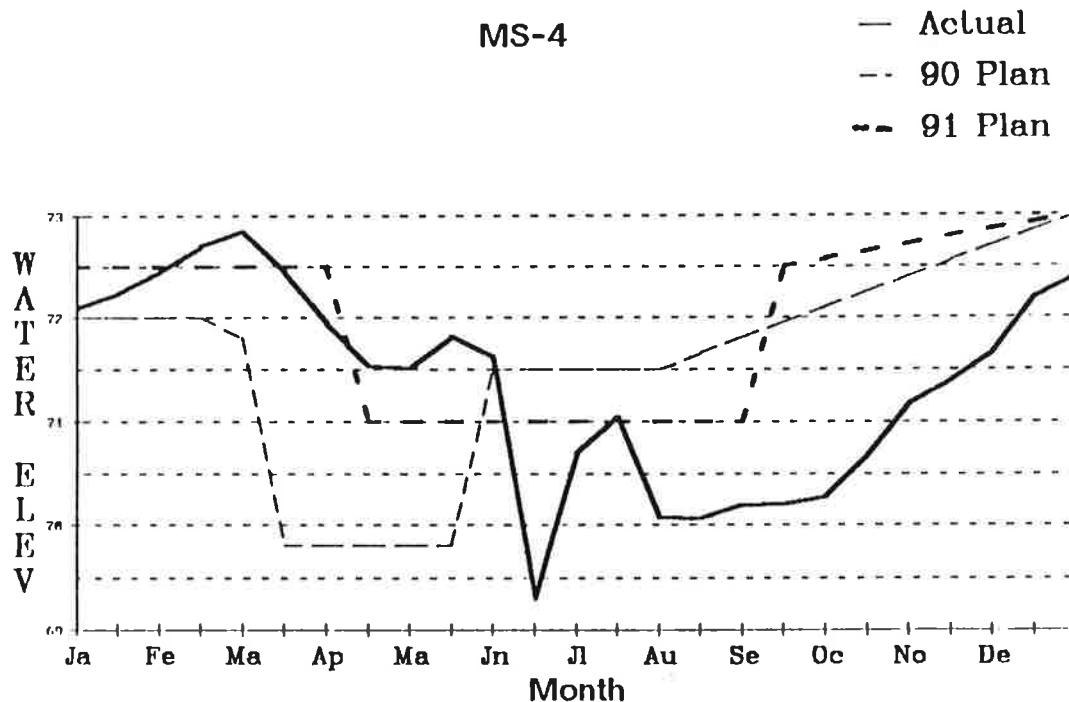
Costs:

Pumping costs totalled \$ 646.01 for the year.

B.2 Objectives of the 1991 Proposed Water Levels

This pool will be maintained with high water levels to discourage brush encroachment. It should be left high until staff and time is available to mow and disk it to put it back into a moist soil or marsh unit. If manpower permits, it may be drained in the summer for mowing and tillage.

1. Unit MSU 4
2. Acres 106
3. Maximum elevation permissible 574
4. Flowline elevation of lowest structure 567
5. Water Elev. with 50% bottom exposed - 571.5
- 90% bottom exposed -



7. Vegetation:

Species	%1988	%1989	%1990
Reed Canarygrass/Willow	15	20	10
Millet/Bidens/Smartweed	50	15	10
Agriculture	30	5	0
Borrow	5	5	5
Upland		55	0
Planted Millet/Buckwheat			30
Planted Wheat			45

8. Wildlife Use:

	Use Days		
	1988	1989	1990
Ducks	4,400	3,000	31,170
Geese	4,700	4,000	33,990
GBH	400	200	960

9. Purple Loosestrife: None noted. Phragmites patch located on the east side, sprayed one acre with 5 gallons of Rodeo solution.

A.2 Effects of Past Year's Water Levels

Levels:

The unit was dewatered in the spring to begin restoration to a moist soil unit. The area was plowed and disked then planted to buckwheat/millet in the southern end and wheat in the rest of the unit. Water levels were raised gradually in the late fall.

Results:

The area produced millet and buckwheat seeds. The young plants were feed on by geese and ducks in the summer and fall. When the water was added a large number of waterfowl utilized the area. It should also provide food for spring migration.

Facilities:

Construction was completed by September 1989. Dikes and water control structures are now in good shape.

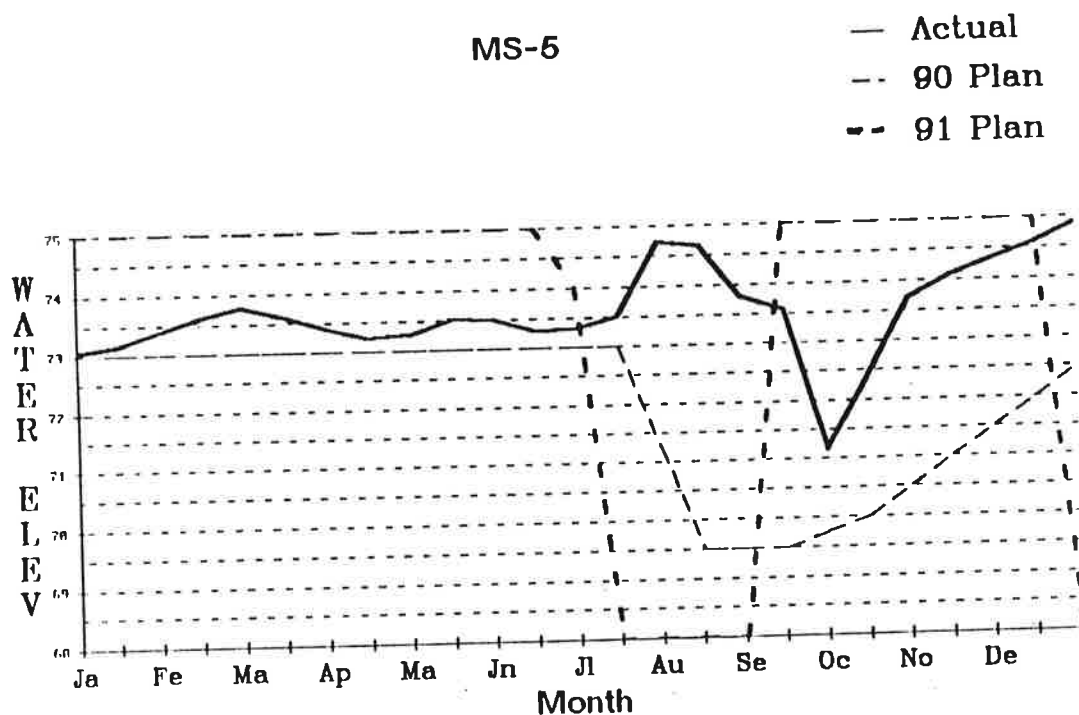
Costs:

Electricity to run the moist soil pump cost approximately \$ 1,292.02. A portable pump was also used to lower the water level. Costs were also incurred during the disking and planting of the unit. The unit was plowed and disked by a cooperative farmer.

B.2 Objectives of the 1991 Proposed Water Levels

Shallow water should be maintained until after the spring migration. In mid-April, the unit should be drawn down until the unit is moist to encourage natural moist soil regeneration. Water should be added as necessary to prevent cocklebur from getting out of hand. Then the unit should be flooded gradually to make the moist soil plants available for migrating waterfowl.

1. Unit MSU 5
2. Acres 250
3. Maximum elevation permissible 573
4. Flowline elevation of lowest structure 567
5. Water Elev. with 50% bottom exposed - 570.5
- 90% bottom exposed -



7. Vegetation:

Species	%1988	%1989	%1990
<u>Millet/Smartweed</u>	<u>55</u>	<u>40</u>	<u>5</u>
<u>Agriculture</u>	<u>0</u>	<u>0</u>	<u>0</u>
<u>Bidens</u>	<u>10</u>	<u>10</u>	<u>0</u>
<u>Cattail/Reed Canarygrass</u>	<u>10</u>	<u>5</u>	<u>15</u>
<u>Cottonwood/Willow</u>	<u>15</u>	<u>40</u>	<u>50</u>
<u>Velvet Leaf</u>	<u>10</u>	<u>5</u>	<u>0</u>
<u>Open Water</u>	<u> </u>	<u> </u>	<u>30</u>

8. Wildlife Use:

	Use Days		
	1988	1989	1990
<u>Ducks</u>	<u>4,400</u>	<u>10,000</u>	<u>121,020</u>
<u>Geese</u>	<u>5,500</u>	<u>20,000</u>	<u>87,390</u>
<u>GBH</u>	<u>700</u>	<u>400</u>	<u>3,240</u>

9. Purple Loosestrife: None observed.

MSU 5

A.2 Effects of Past Year's Water Levels

Levels:

Water levels were kept high to flood out the willow/cottonwood that had begun to take over. In September the pool was dewatered to facilitate construction of a duck trap in the unit. A few areas were dry enough to mow willow as well (along the western dike).

Results:

The area still has many willow and cottonwood seedlings. The high water stressed the plants to an extent. Cattails are beginning to grow in the area as well. A small amount of millet was located along the north dike where disturbance from the construction created mudflats. Waterfowl used the area extensively especially during the fall migration and baiting of the duck trap.

Facilities:

Filter fabric, rip rap and placement of the water control structure was completed in 1989.

Costs:

Areas in the western section of the pool were mowed. Electricity to run the moist soil pump totalled \$ 1,938.04 for the unit.

B.2 Objectives of the 1991 Proposed Water Levels

Water levels will be kept high to discourage growth of undesirable species until late June or early July. The area will then be dewatered completely and the area mowed and possibly disked to kill willow. It will then be reflooded until freeze up and dewatered again and kept dry during the winter months.

9. Purple Loosestrife: None noted.

A.2 Effects of Past Year's Water Levels

Levels:

The unit fluctuated with the lake through breached dikes during the beginning of the year. The north dike was rehabilitated during the summer and a short temporary dike constructed across the south end to retain approximately 1/2 of the unit flooded. Water was added to the unit by using a crystifoli pump.

Results:

Cattail is dominate with willow, cottonwood and Phragmites expanding into the area. Waterfowl use of the flooded areas was good during December.

Facilities:

The north dike was rebuilt during the summer. With the temporary dike, the unit is now capable of holding some water. The east dike was rebuilt during the rehabilitation of the adjacent ditch. Minor extension of inlet/outlet culverts to the moist soil pump is all that's needed to provide active water level control if the dikes could hold water. A water gauge is needed to accurately record the units progress.

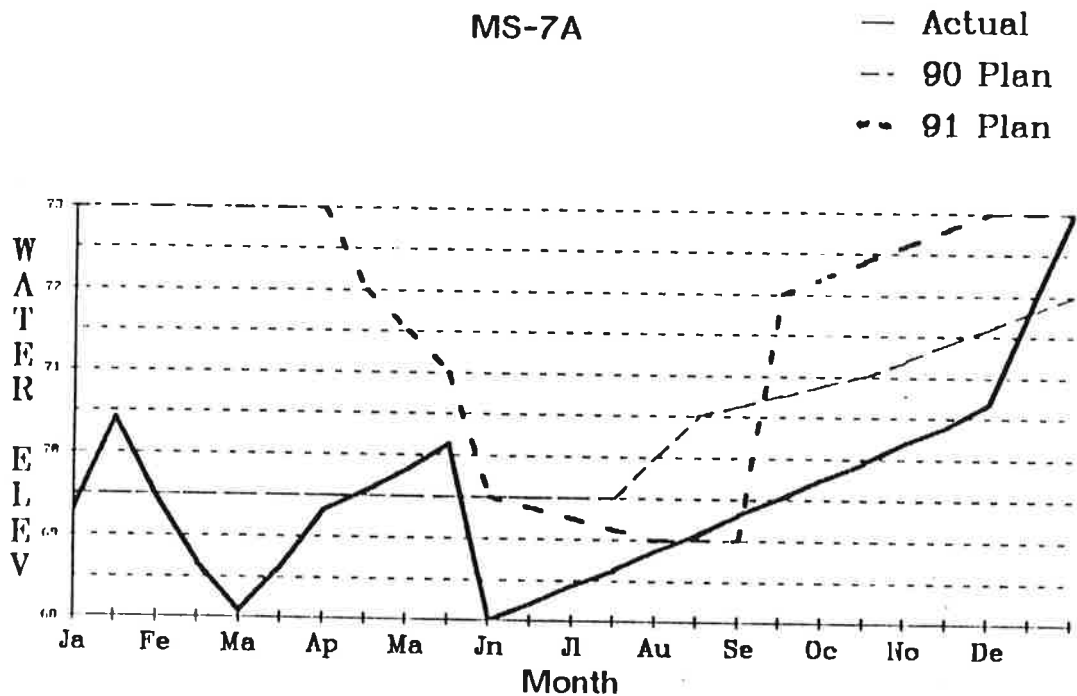
Costs:

Costs were incurred during the rebuilding of the dikes. Both the rented 650 dozer and the 450 dozer were utilized along with the dragline.

B.2 Objectives of the 1991 Proposed Water Levels

Now that the unit is able to hold some water, more specific management can be done. Willow, cottonwood and dense cattail will need to be controlled to allow this unit to be used as either a marsh or moist soil area. High water levels in the unit will effect some control but at the same time cause erosion to the newly built dikes. Mechanical methods will have to be used in conjunction with water. Current plans call for holding as much water as possible until mid summer, then drying up unit and reconstructing the main south dike and mowing all willow and cottonwood.

1. Unit MSU 7A
2. Acres 49
3. Maximum elevation permissible 573.5
4. Flowline elevation of lowest structure 570.5
5. Water Elev. with 50% bottom exposed - 572.0
- 90% bottom exposed -



7. Vegetation:

Species	%1988	%1989	%1990
Upland Species	30	35	0
Cattail	0	5	0
Millet	15	10	0
Bidens	30	20	0
Smartweed	25	15	18
Cottonwood/willow		15	2
Planted Millet/Buckwheat			47
Planted Wheat/Upland Grass			33

8. Wildlife Use:

	Use Days		
	1988	1989	1990
Ducks	19,200	12,000	240
Geese	19,500	8,000	6,420
GBH	250	350	360

9. Purple Loosestrife: None observed. The area where it had been located was plowed this year.

A.2 Effects of Past Year's Water Levels

Levels:

Water levels were kept low to facilitate the completion of the north dike.

Results:

The eastern half of the unit was plowed, disked and planted with a combination of millet/buckwheat and wheat. This was done to set back the succession and regain a moist soil unit. The millet/buckwheat provided competition for other weed species but did not produce seed to any great extent. Wheat provided grazing for geese and was utilized. Limited waterfowl use occurred due to a lack of water.

Facilities:

The north dike was reconstructed in 1990. A new pump station was installed in 1989.

Costs:

Electricity for pumping cost \$ 635.13. Costs were also incurred in the planting of the field by the staff. The unit was plowed and disked by a cooperative farmer.

B2. Objectives of the 1991 Proposed Water Levels

The unit will be flooded in the spring to provide food for the spring migrants. Water levels should be dropped in mid-spring to assist in moist soil plant growth. Water should be added as necessary to offset evaporation and prevent cocklebur and other unwanted species from establishing. Water should be added to make available food for either fall migrants or spring migrants.

9. Purple Loosestrife: None observed. Previous locations were plowed this year.

MSU 7B

A.2 Effects of Past Year's Water Levels

Levels:

Water levels were kept low to allow rehabilitation of the north dike.

Results:

The northwest half of the unit was planted to millet/buckwheat to set back succession. The other half was planted to wheat and mixed grasses on the far southeast corner. Some natural smartweed growth also occurred in the far northwest corner. Some goose use of the area occurred during the seedling stages. Shorebirds also utilized the area.

Facilities:

The north dike was reconstructed in 1990 and a water control gate was placed in the north west corner. All water for this unit will now come from MSU 7A with its pump. A water gauge is needed in this unit to correctly manage it.

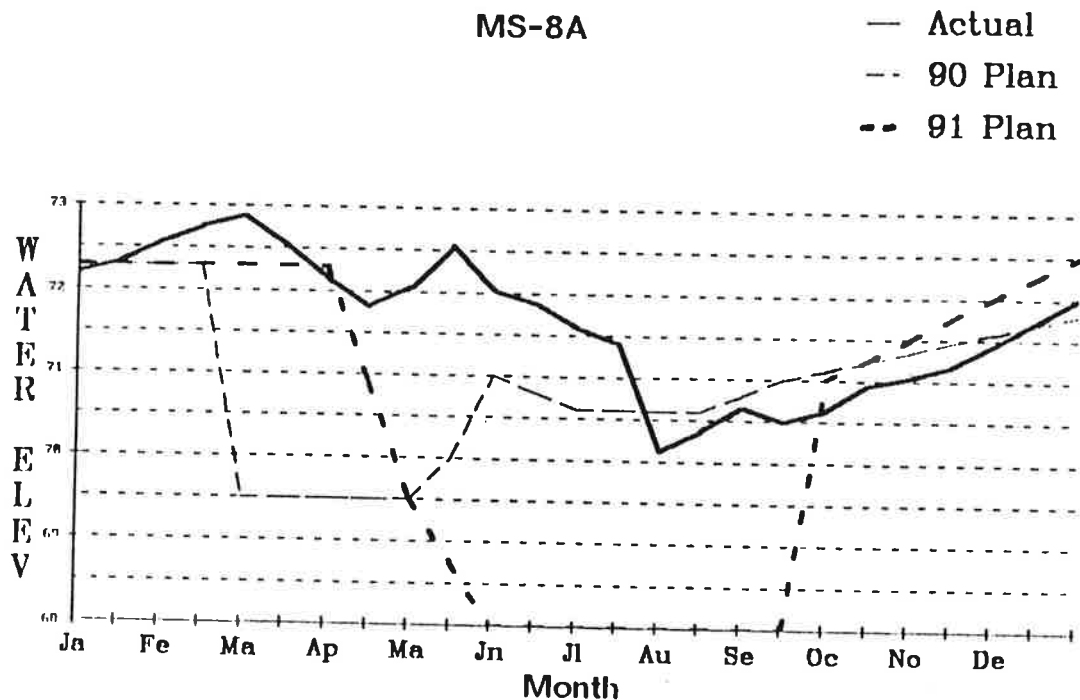
Costs:

Costs were incurred during planting of the unit by refuge staff. The unit was plowed and disked by a cooperative farmer.

B.2 Objectives of the 1991 Water Levels

This unit must be treated similarly to Unit 7A in restoring it to a moist soil unit until dike repairs will allow separate management. The far southeast corner will remain dry as a upland for possible nesting cover. If dike repairs along the dike between 7A and 7B can be done during the year, then reflooding of the unit should complement reflooding of 7A to provide alternative food sources for spring and fall migrants (eg. if 7A is flooded in the fall, 7B should be flooded in the spring.) If dike repairs are not done, flooding must be done simoustanously.

1. Unit MSU 8A
2. Acres 44
3. Maximum elevation permissible 573
4. Flowline elevation of lowest structure 570
5. Water Elev. with 50% bottom exposed - 571.5
- 90% bottom exposed -



7. Vegetation:

Species	1988	1989	1990
Millet/Smartweed (mudflats)	20	25	42
Bidens	2	5	5
Open Water	50	45	8
Upland Sup./Velvet Leaf	25	20	40
Cottonwood/Willow	3	5	5

8. Wildlife Use:

	Use Days		
	1988	1989	1990
Ducks	48,500	36,500	14,370
Geese	7,400	12,300	24,900
GBH	3,300	2,900	750

9. Purple Loosestrife: None observed.

MSU 8A

A.2 Effects of Past Year's Water Levels

Levels:

Average water levels occurred during most of the year. In August the water level was dropped to assist in carp control.

Results:

Upland species occurred on the southern section of the pool. After the late drawdown, smartweed and millets began to occur on the mudflats. Waterfowl and shorebirds used this area to some extent in the fall.

Facilities:

A pump station was constructed in the south west corner of the unit in 1989. The pump was used for a period of time then difficulties began. It was down for most of the year. A crack was also repaired in one of the walls of the pump station in 1990.

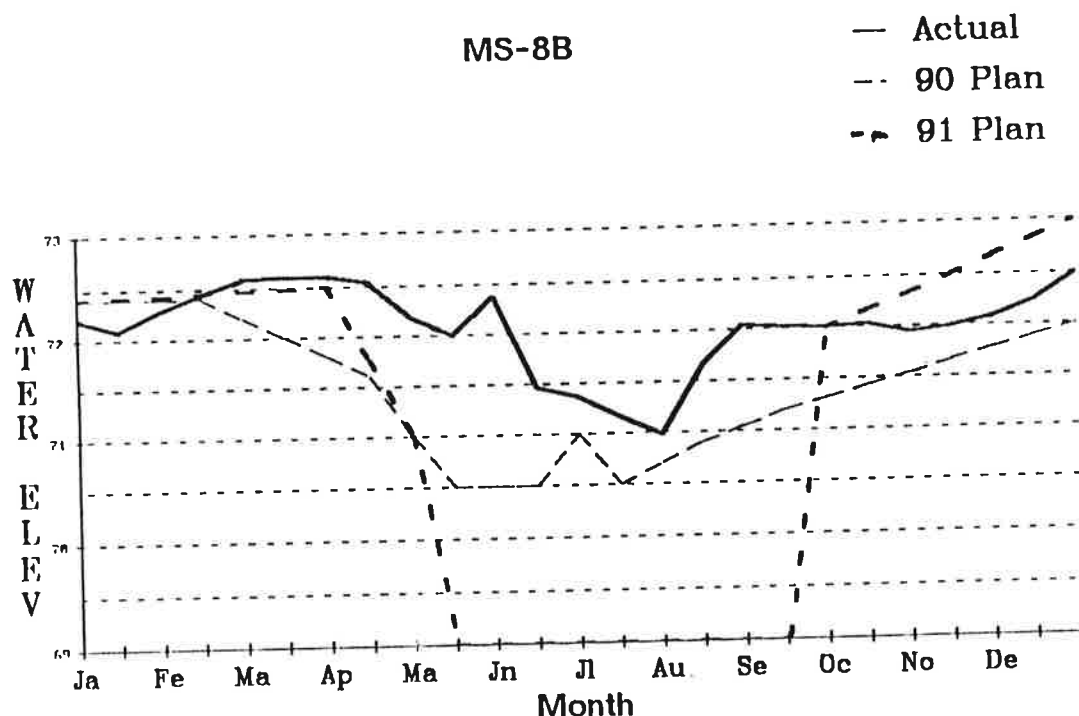
Costs:

Electricity costs for the unit in 1990 were \$455.07.

B.2 Objectives of the 1991 Proposed Water Levels

Water levels should be raised in late winter, early spring to discourage weed growth. Water will be released in mid-Spring to allow drying for the construction work on the west dike. Once construction is completed, water levels should be gradually raised in the fall to accommodate waterfowl use.

1. Unit MSU 8B
2. Acres 85
3. Maximum elevation permissible 572.5
4. Flowline elevation of lowest structure 571.5
5. Water Elev. with 50% bottom exposed - 571
- 90% bottom exposed -



7. Vegetation:

Species	1988	1989	1990
<u>Millet (+ velvet leaf)</u>	<u>45</u>	<u>28</u>	<u>38</u>
<u>Bidens</u>	<u>30</u>	<u>15</u>	<u>0</u>
<u>Upland Species</u>	<u>10</u>	<u>5</u>	<u>10</u>
<u>Cocklebur</u>	<u>5</u>	<u>2</u>	<u>2</u>
<u>Water/Submerged Aquatics</u>	<u>10</u>	<u>15</u>	<u>5</u>
<u>Emergents (Rushes)</u>	<u> </u>	<u>35</u>	<u>45</u>

8. Wildlife Use:

	Use Days		
	1988	1989	1990
<u>Ducks</u>	<u>101,000</u>	<u>85,000</u>	<u>49,800</u>
<u>Geese</u>	<u>29,500</u>	<u>32,000</u>	<u>27,000</u>
<u>GBH</u>	<u>2,500</u>	<u>12,000</u>	<u>2,310</u>

9. Purple Loosestrife: Scattered plants (seven) in northeast corner of the pool. Sprayed with Rodeo (1 gallon of solution) from the ATV.

MSU 8B

A.2 Effects of Past Year's Water Levels

Levels:

Water levels were kept high until May when levels were gradually drawn down. The pool was in moist soil conditions from June through August. Water was gradually added to the unit in August.

Results:

The water levels encouraged concentrations of millet and emergents (rushes). This unit had large numbers of ducks, geese, coots, great blue herons and Great egrets.

Facilities:

Minor erosion is a problem along the north dike. The unit should not be held high or the north and west dikes will erode unnecessarily. The pump station, which pumps water in and out of an adjacent ditch to the south, was completed in 1989. In 1990 the old culvert on the south dike was removed due to muskrat activity. It was filled in then another culvert was placed to the west of the old one.

Cost:

The electricity for the pump was \$ 379.16 which included draining of the woods to the west and the surrounding ditches as well as the pumping of Unit 8b. A new culvert and dirt work was completed on the south dike. The dikes were mowed once during the year.

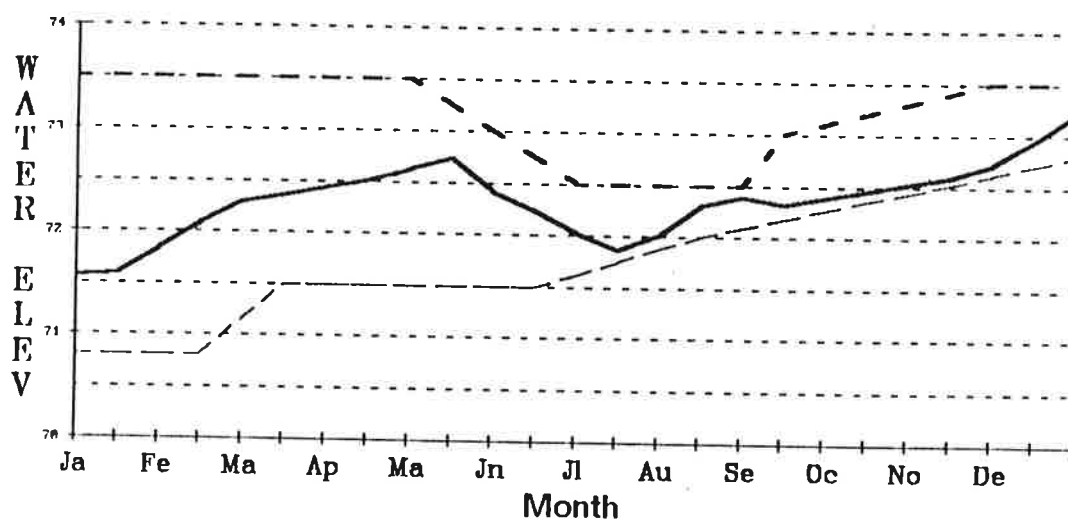
B.2 Objectives of the 1991 Proposed Water Levels

The unit is in need of rehabilitation. If time and personnel are available, the unit should be drained early in the spring then disked and reflooded until early summer. Otherwise, drawdown slowly from April to May to encourage moist soil plants. Add several inches during the summer to wet the soil and drown undesirable species. Reflood in fall for waterfowl migration.

1. Unit Cedar Point - Pool 1
2. Acres 1,460
3. Maximum elevation permissible 574
4. Flowline elevation of lowest structure 569.4
5. Water Elev. with 50% bottom exposed - 571
- 90% bottom exposed -

Cedar Pt. Main Pool

— Actual
-- 90 Plan
-- 91 Plan



7. Vegetation:

Species	%1988	%1989	%1990
<u>Open Water</u>	<u>3</u>	<u>25</u>	<u>15</u>
<u>Water Lily</u>	<u>2</u>	<u>3</u>	<u>3</u>
<u>Cattail</u>	<u>20</u>	<u>30</u>	<u>30</u>
<u>Burreed/Bulrush</u>	<u>10</u>	<u>5</u>	<u>20</u>
<u>Other</u>	<u>10</u>	<u>10</u>	<u>2</u>
<u>Smartweed/Milletts/Nutsedge</u>	<u>55</u>	<u>10</u>	<u>15</u>
<u>Phragmites/Purple Loosestrife</u>	<u> </u>	<u>17</u>	<u>15</u>

8. Wildlife Use:

	Use Days		
	1988	1989	1990
<u>Ducks</u>	<u>693,000</u>	<u>589,000</u>	<u>1,211,280</u>
<u>Geese</u>	<u>53,000</u>	<u>96,300</u>	<u>77,640</u>
<u>GBH</u>	<u>40,600</u>	<u>25,600</u>	<u>6,990</u>

9. Purple Loosestrife: Large clusters of loosestrife throughout the pool. Control consisted of 300 gallons Rodeo solution sprayed by helicopter (30 acres, 5% solution), 35 gallons by airboat (7 acres, 1% solution), and plants were pulled and burned by staff and YCC.

Cedar Point - Pool 1

A.2 Effects of Past Year's Water Levels

Levels:

Water levels were gradually increased throughout the year. Evaporation of the unit occurred in the summer and the pumps could not keep up with it.

Results:

Many areas continued to developed dense stands of Walter's millet, smartweeds and nutsedge. Small patches of wild rice were also found in the unit. Cattail continues to be the predominate vegetation. Loosestrife and Phragmites seem to have remained constant. Submergent vegetation began to grow in the deeper pools in the unit.

Facilities:

A majority of the road system needs grading and gravel except along drainage canal where roads were redone along with construction. The dike that borders the fishing barrow pit is becoming dangerously narrow in two spots and is developing ruts that if hit at high speeds could result in disaster. A new pump structure was installed in Pool 1 by early 1990. All interior canals are completely silted in and need dredging. At this time, they are a hazard to anyone attempting to cross by foot the 4' deep muck. Dikes were mowed once.

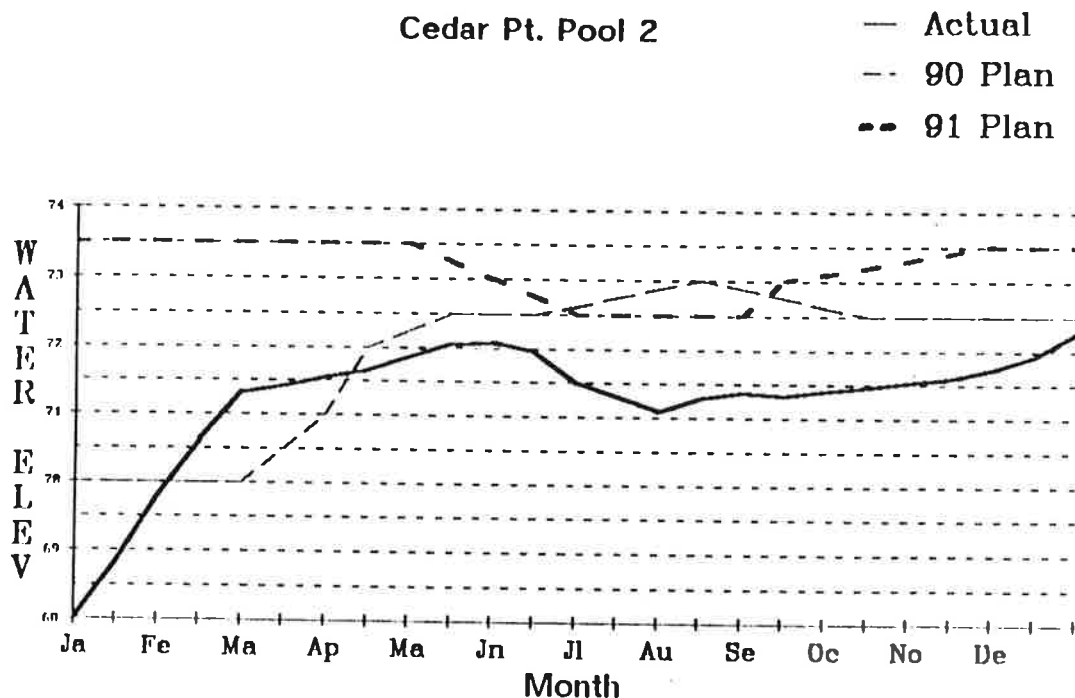
Costs:

The pump structure costs were covered by the Cedar Point Pump Structure contract. All the dikes were mowed once. Early blooming loosestrife was hand pulled by YCC and staff then burned. Rodeo was aeriaily sprayed on 30 acres of loosestrife (300 gallons of a 5% solution). Approximately 7 acres were treated by airboat (35 gallons of a 1% solution). Electricity costs for the pump were \$ 9,493.16.

B.2 Objectives of 1991 Proposed Water Levels

Water levels should be fairly high in the spring to offset summer evaporation. This will lessen pumping costs during the summer to maintain the water levels. The high water levels will encourage emergents and submergents and discourage purple loosestrife. Raise water level in the fall for waterfowl use.

1. Unit Cedar Point - Pool 2
2. Acres 135
3. Maximum elevation permissible 574
4. Flowline elevation of lowest structure 569.4
5. Water Elev. with 50% bottom exposed - 571
- 90% bottom exposed -



7. Vegetation:

Species	%1988	%1989	%1990
<u>Open Water (submergent & barrow)</u>	<u>5</u>	<u>5</u>	<u>13</u>
<u>Cattail</u>	<u>20</u>	<u>28</u>	<u>37</u>
<u>Bullrush</u>	<u>5</u>	<u>5</u>	<u>2</u>
<u>Burreed</u>	<u>3</u>	<u>2</u>	<u>0</u>
<u>Phragmites/Willow</u>	<u>7</u>	<u>10</u>	<u>15</u>
<u>Smartweed/Millet/Nutsedge</u>	<u>60</u>	<u>20</u>	<u>10</u>
<u>Cottonwood/Willow</u>	<u> </u>	<u>30</u>	<u>23</u>

8. Wildlife Use:

	Use Days		
	1988	1989	1990
<u>Ducks</u>	<u>308,300</u>	<u>117,100</u>	<u>23,760</u>
<u>Geese</u>	<u>14,100</u>	<u>13,500</u>	<u>1,050</u>
<u>GBH</u>	<u>18,800</u>	<u>6,500</u>	<u>1,020</u>

9. Purple Loosestrife: Small patches along the north dike, a large patch on the west end of the pool. Rodeo was sprayed by helicopter for loosestrife (25 gallons solution, 2.5 acres) and Phragmites (50 gallons of solution, 5 acres).

Cedar Point - Pool 2

A.2 Effects of Past Year's Water Levels

Levels:

Pool 2 water levels are directly connected with Pool 1 through the interconnecting water control structure. In the late summer ditches were cleared to maintain the connection. Water levels remained moderate to low.

Results:

Cottonwood seedlings, Phragmites, Purple loosestrife and cattail dominate this pool. The area should be burned next year. Very little waterfowl use occurred in this pool.

Facilities:

The main water control structure has been silted in for years. The elevation difference between Pool 1 & 2 make it difficult to add water to Pool 2 from that direction. The north and east dikes are in good condition. The south dike has little slope left and the east dike is breached. A water gauge is located south of the control structure from Pool 1 to Pool 2 but a water gauge needs to be placed with in Pool 2 for more accurate readings.

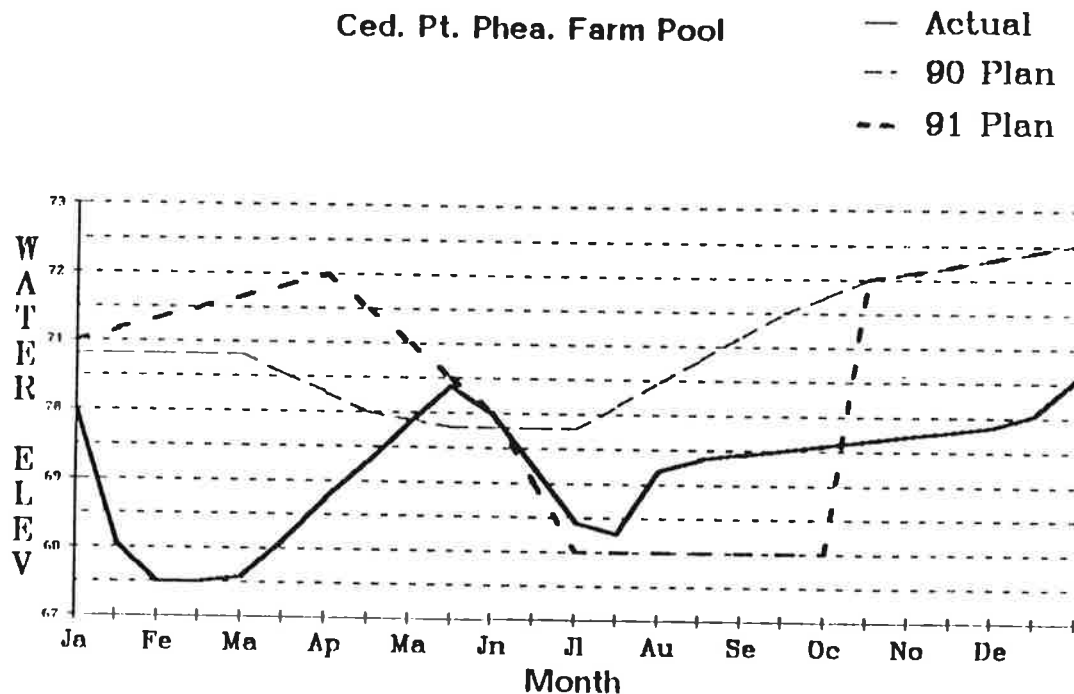
Costs:

Dikes were mowed once. Twenty-five gallons of Rodeo solution was used to spray loosestrife in the pool by helicopter (2.5 acres). Phragmites was also sprayed in the unit with 50 gallons of Rodeo (5 acres also by helicopter).

B.2 Objectives of 1991 Proposed Water Levels

Water levels should be fairly high in the spring to offset summer evaporation. This will lessen pumping costs during the summer to maintain the water levels. The high water levels will encourage emergents and submergents and discourage purple loosestrife. Raise water level in the fall for waterfowl use.

1. Unit Cedar Point Pheasant Farm
2. Acres 155
3. Maximum elevation permissible 574
4. Flowline elevation of lowest structure 571
5. Water Elev. with 50% bottom exposed - 571
- 90% bottom exposed -



7. Vegetation:

Species	%1988	%1989	%1990
<u>Cattail</u>	<u>45</u>	<u>40</u>	<u>36</u>
<u>Open Water (submerg. aquatics)</u>	<u>20</u>	<u>10</u>	<u>15</u>
<u>Burreed/Arrowhead</u>	<u>5</u>	<u>5</u>	<u>5</u>
<u>Smartweed/Millet</u>	<u>20</u>	<u>10</u>	<u>5</u>
<u>Other (Purple Loosestrife)</u>	<u>10</u>	<u>35</u>	<u>25</u>
<u>Open Water (barrow pits)</u>	<u> </u>	<u> </u>	<u>14</u>

8. Wildlife Use:

	Use Days		
	1988	1989	1990
<u>Ducks</u>	<u>175,500</u>	<u>71,905</u>	<u>15,810</u>
<u>Geese</u>	<u>33,000</u>	<u>4,100</u>	<u>26,940</u>
<u>GBH</u>	<u>8,500</u>	<u>2,500</u>	<u>1,500</u>

9. Purple Loosestrife: Large patches throughout. Some spots are becoming a homogenous stand of loosestrife. Rodeo was used in a 5% solution by helicopter to cover 5 acres (50 gallons solution).

Cedar Point - Pheasant Farm

A.2 Effects of Past Year's Water Levels

Levels:

Water levels were moderate at the beginning of the year. Summer evaporation reduced the level considerably. Additional water was added late in the year.

Results:

Purple Loosestrife continues to be a problem in this pool. Little duck use was observed in the area. The entire pool is dominated by loosestrife and cattail. A small amount of waterfowl utilized this pool.

Facilities:

The dikes of this unit are in poor condition. Banks of the west and east dikes severely eroded. The south and north dikes are eroded on the interior side only. The current gauge in the pool is located in an isolated barrow area where accurate measurement is not possible an new gauge should be placed in the pool or the old one should be relocated.

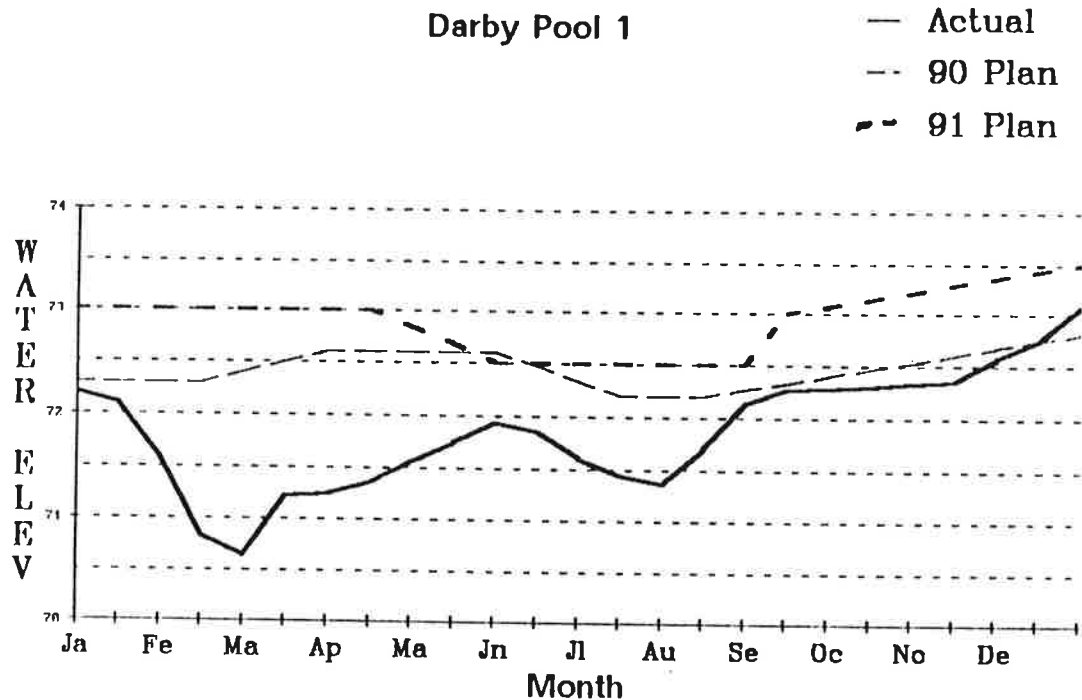
Costs:

Five acres of loosestrife were sprayed by helicopter (50 gallons of a 5% solution of Rodeo).

B.2 Objectives of 1991 Proposed Water Levels

This unit will be held as high as possible without pumping until mid-June. Then the unit will be dewatered completely for dike construction. If manpower, permits cattails may be disked, sprayed, etc. for control while the unit is dry. Hopefully, construction will be complete to allow reflooding by fall.

1. Unit Darby - Pool 1
2. Acres 200
3. Maximum elevation permissible 573
4. Flowline elevation of lowest structure 566
5. Water Elev. with 50% bottom exposed - 569
- 90% bottom exposed -



7. Vegetation:

Species	%1988	%1989	%1990
<u>Open Water</u>	<u>30</u>	<u>25</u>	<u>30</u>
<u>Bulrush/Burreed</u>	<u>5</u>	<u>5</u>	<u>4</u>
<u>Cattail, Bluejoint, Other</u>	<u>20</u>	<u>15</u>	<u>20</u>
<u>Floating Emergents</u>	<u>25</u>	<u>25</u>	<u>25</u>
<u>Smartweed/Millet/Nutsedge</u>	<u>25</u>	<u>10</u>	<u>5</u>
<u>Phragmites</u>	<u> </u>	<u>10</u>	<u>2</u>
<u>Other</u>	<u> </u>	<u>10</u>	<u>4</u>
<u>Cottonwood/willow</u>	<u> </u>	<u> </u>	<u>10</u>

8. Wildlife Use:

	Use Days		
	1988	1989	1990
<u>Ducks</u>	<u>157,500</u>	<u>110,000</u>	<u>65,610</u>
<u>Geese</u>	<u>24,000</u>	<u>35,700</u>	<u>45,060</u>
<u>GBH</u>	<u>9,300</u>	<u>6,720</u>	<u>4,770</u>

9. Purple Loosestrife: Large clusters of loosestrife throughout the pool. Sprayed with a 5% solution of Rodeo on a total of 5 acres by helicopter (50 gallons of solution).

Darby - Pool 1

A.2 Effects of Past Year's Water Levels

Levels:

Water levels were low in the spring to moderate towards fall.

Results:

Water not choked with spadderdock, pickerel weed or lotus was full of submerged aquatics (canals and east end). Rose mallow, purple loosestrife, and Phragmites continued to be a problem in the unit. Waterfowl use (Wood ducks especially) was steady throughout the year.

Facilities:

All but the east dike have slight to moderate erosion.

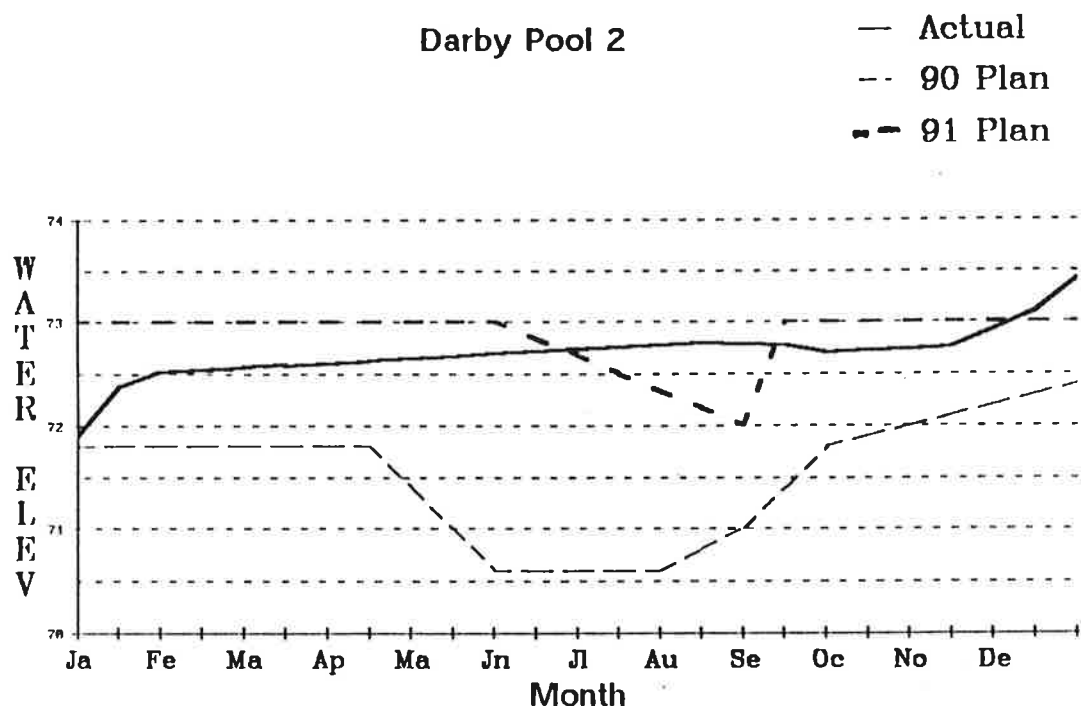
Costs:

All dikes were mowed once in 1990. 50 gallons of Rodeo solution was used to spray loosestrife and Phragmites in the pool by helicopter (5 acres). Water was added to the pool by gravity only.

B.2 Objectives of 1991 Proposed Water Levels

Maintain moderate to high levels during nesting season. Allow water to lower by natural evaporation in midsummer to encourage invertebrates. Raise level in the fall for waterfowl use.

1. Unit Darby - Pool 2
2. Acres 25
3. Maximum elevation permissible 573
4. Flowline elevation of lowest structure 569
5. Water Elev. with 50% bottom exposed - 570
- 90% bottom exposed -



7. Vegetation:

Species	%1988	%1989	%1990
<u>Open Water/Submergents</u>	<u>15</u>	<u>30</u>	<u>26</u>
<u>Cattail</u>	<u>5</u>	<u>20</u>	<u>32</u>
<u>Pickereel Weed</u>	<u>5</u>	<u>30</u>	<u>18</u>
<u>Other (Inc. Purple Loosestrife)</u>	<u>10</u>	<u>10</u>	<u>7</u>
<u>Smartweed/Millet/Nutsedge</u>	<u>65</u>	<u>10</u>	<u>0</u>
<u>Cottonwood/willow</u>	<u> </u>	<u> </u>	<u>17</u>

8. Wildlife Use:

	Use Days		
	1988	1989	1990
<u>Ducks</u>	<u>6,000</u>	<u>6,100</u>	<u>14,940</u>
<u>Geese</u>	<u>1,000</u>	<u>850</u>	<u>2,880</u>
<u>GBH</u>	<u>2,000</u>	<u>1,500</u>	<u>210</u>

9. Purple Loosestrife: Scattered plants. Sprayed 10 gallons of solution on 1 acre by helicopter, and 230 gallons solution by airboat and back pack (30 acres treated).

Darby - Pool 2

A.2 Effects of Past Year's Levels

Levels:

Water levels were fairly stable varying from 72.0 to 73.5.

Results:

Purple loosestrife infestation remaining stable despite efforts to control it. Cattail and submergents remain the dominant species. Large numbers of pintails were observed in this pool in the spring.

Facilities:

Dikes along the west and south sides are in good shape. The banks of the north and east dikes are eroded and without rip-rap protection. The culvert of the water control structure was replaced in 1989. More work will be done on the north dike in 1991. A new water level gauge was surveyed and placed on the water control structure during the year.

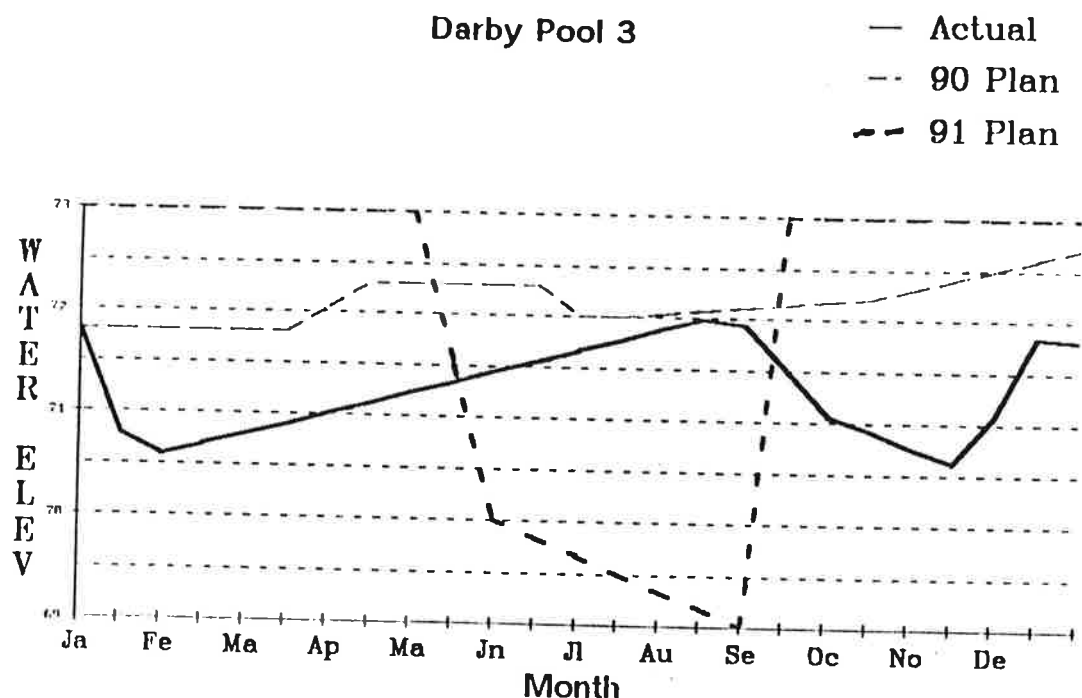
Costs:

Dikes were mowed once. Construction on dikes and pump station, which will aid in water manipulation in Pools 1, 2, 3, and 4, was completed in late 1990. Ten gallons of Rodeo solution was sprayed by helicopter (1 acre). An additional 230 gallons of a 1% solution of Rodeo were sprayed by airboat and backpacks (30 acres). The pump in the ditch was used to dewater the ditch for construction purposes, add water to Pool 2 and 3, and dewater Pool 4 when flooding became a problem. Total costs for the Darby pump were \$ 1334.58. Each unit utilized approximately one quarter of the cost.

B.2 Objectives of 1991 Proposed Water Levels

Maintain current water level through nesting then drawdown the pool to encourage invertebrates. Water should be gradually increased for fall migration.

1. Unit Darby - Pool 3
2. Acres 25
3. Maximum elevation permissible 573
4. Flowline elevation of lowest structure 569
5. Water Elev. with 50% bottom exposed - 570
- 90% bottom exposed -



7. Vegetation:

Species	%1988	%1989	%1990
<u>Open Water</u>	<u>30</u>	<u>30</u>	<u>18</u>
<u>Aquatic Smartweed</u>	<u>0</u>	<u>10</u>	<u>0</u>
<u>Smartweed/Millet/Nutsedge</u>	<u>65</u>	<u>5</u>	<u>5</u>
<u>Other</u>	<u>15</u>	<u>15</u>	<u>15</u>
<u>Pickerel Weed</u>		<u>40</u>	<u>24</u>
<u>Cattail</u>			<u>37</u>
<u>Loosestrife</u>			<u>5</u>
<u>Cottonwood/Willow</u>			<u>16</u>

8. Wildlife Use:

	Use Days		
	1988	1989	1990
<u>Ducks</u>	<u>35,600</u>	<u>25,470</u>	<u>2,100</u>
<u>Geese</u>	<u>5,500</u>	<u>1,500</u>	<u>60</u>
<u>GBH</u>	<u>1,300</u>	<u>800</u>	<u>870</u>

9. Purple Loosestrife: Found plants throughout the pool especially along the southern edge. Sprayed by helicopter 15 gallons of Rodeo solution on 1.5 acres.

Darby - Pool 3

A.2 Effects of Past Year's Levels

Levels:

Water levels were low early in the year. In midsummer water levels increased. A decrease in water levels occurred in October/November during the lowering of pool 4.

Results:

Cattail and pickerel weed dominated the unit. Loosestrife is intermixed with cattail in the south section of the unit. Waterfowl use of the area was very limited.

Facilities:

The north, east and west dikes are eroded on both sides and need resloping and rip rap protection. The water control structure was replaced in 1989. Work is planned for the north dike in 1991. A water level gauge was surveyed and placed on the water control structure during 1990.

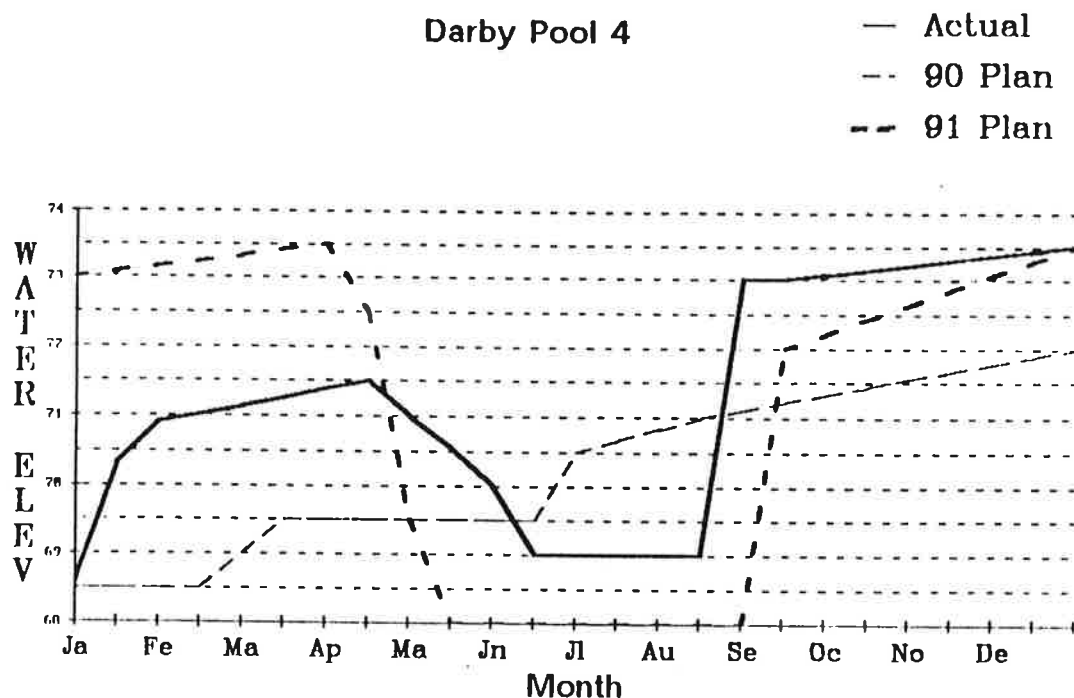
Costs:

Dikes were mowed once. The culvert and screw gate were replaced by the refuge staff in 1989. Construction on dikes and pump station, which will aid in water manipulation in Pools 2, 3, and 4, was completed in 1990. Fifteen gallons of a 5% Rodeo solution was applied by helicopter (1.5 gallons).

B.2 Objectives of 1991 Proposed Water Levels

Water levels may have to be dropped to facilitate rehabilitation of the north dike. The pool water level should be kept relatively high to discourage spread of purple loosestrife.

1. Unit Darby - Pool 4
2. Acres 170
3. Maximum elevation permissible 573.5
4. Flowline elevation of lowest structure 566.6
5. Water Elev. with 50% bottom exposed - 567.5
- 90% bottom exposed -



7. Vegetation:

Species	1988	1989	1990
Open Water	61	75	56
Floating emergents	<1	1	5
Cattail	1	5	17
Cottonwood/Willow	7	10	18
Other	6	4	4
Smartweed/Millet/Nutsedge	25	5	0

8. Wildlife Use:

	Use Days		
	1988	1989	1990
Ducks	136,000	53,486	51,600
Geese	23,000	28,600	10,650
GBH	5,200	3,000	3,540

9. Purple Loosestrife: Scattered plants especially along the dikes, southwest corner, and southeast corner. Sprayed by helicopter 3.8 acres of loosestrife (38 gallons of 5% solution). ATV used to spray an additional 7 acres (60 gallons of a 1% solution).

Darby - Pool 4

A.2 Effects of Past Year's Water Levels

Levels:

The pool water levels were low to moderate through out the year. Water levels increased during fall flooding and water levels were dropped to assist adjacent land owners.

Results:

The majority of the pool was water covered. Submergents were prevalent throughout the pool. The pool edges developed stands of cattail and willow/cottonwood. The area was used mostly by dabbling ducks unlike past years when divers were more common.

Facilities:

The west and south dikes are slightly eroded but still in fair condition. The water control structure on the south side needs a new boardwalk. A new water control structure was placed on the west dike in 1989 and completely functional in 1990. A water level gauge is needed for this pool.

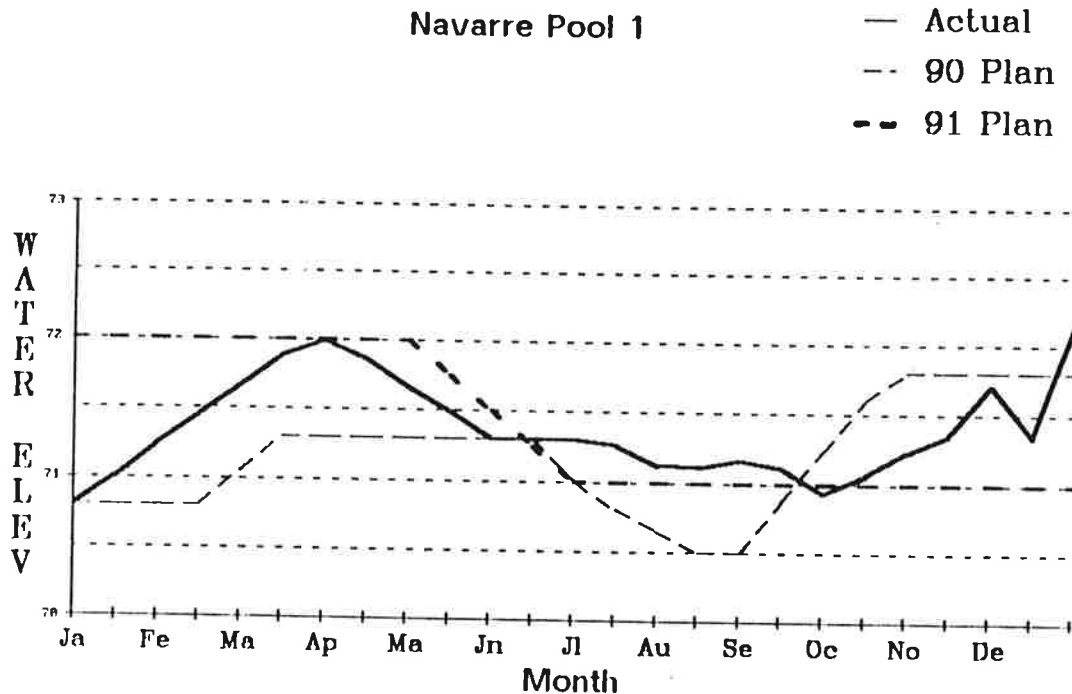
Costs:

All dikes were mowed once. Purple loosestrife in the unit was sprayed with a total of 38 gallons of a 5% Rodeo solution by helicopter (3.8 acres), and 60 gallons of a 1% Rodeo solution by ATV (7 acres).

B.2 Objectives of 1991 Proposed Water Levels

This pool is in need of a good drawdown to increase emergent vegetation and invertebrate response and to allow the construction of a short ditch/dike to isolate a private drainage into the pool. This is necessary before good water control can be done in this unit. Current plans call for complete dewatering as soon as possible in the spring/summer. Then reflood in the fall for waterfowl use.

1. Unit Navarre - Pool 1
2. Acres 130
3. Maximum elevation permissible 573
4. Flowline elevation of lowest structure 569.5
5. Water Elev. with 50% bottom exposed - 568.5
- 90% bottom exposed -



7. Vegetation:

Species	%1988	%1989	%1990
<u>Open Water/Water Lily</u>	<u>40</u>	<u>30</u>	<u>20</u>
<u>Cattail</u>	<u>20</u>	<u>30</u>	<u>30</u>
<u>Bulrush/Burreed</u>	<u>5</u>	<u>5</u>	<u>10</u>
<u>Cottonwood/Willow</u>	<u>10</u>	<u>10</u>	<u>15</u>
<u>Other</u>	<u>5</u>	<u>5</u>	<u>5</u>
<u>Smartweed/Millet</u>	<u>20</u>	<u>10</u>	<u>5</u>
<u>Submergents</u>	<u> </u>	<u>10</u>	<u>5</u>

8. Wildlife Use:

	Use Days		
	1988	1989	1990
<u>Ducks</u>	<u>131,000</u>	<u>81,500</u>	<u>32,460</u>
<u>Geese</u>	<u>107,000</u>	<u>58,600</u>	<u>26,940</u>
<u>GBH</u>	<u>5,600</u>	<u>5,000</u>	<u>1,500</u>

9. Purple Loosestrife: Two plants located in Pool 1. 30 plants located in an adjacent private marsh. All areas sprayed by Davis Besse staff with a total of 3 gallons of Rodeo solution.

Navarre - Pool 1

A.2 Effects of Past Year's Water Levels

Levels:

Water levels generally followed the water management plan for the year.

Results:

Cattail, emergent and submergents dominated the unit. Waterfowl use was average but not great. The reduction in numbers could be due to an increase in vegetation to hide in.

Facilities:

All facilities are maintained by Davis Besse staff. Brush encroachment on the dikes is making censusing difficult as well as damaging the dikes.

Costs:

All pumping costs were paid by Toledo Edison. Two purple loosestrife plants were sprayed in Pool 1 and an additional 30 were sprayed in an adjacent private marsh by Davis Besse employees. A total of 3 gallons of Rodeo solution was sprayed by backpack.

B.2 Objectives of 1991 Proposed Water Levels

Maintain water levels through out nesting season. Then increase water levels to open up emergents.

9. Purple Loosestrife: None observed.

Navarre - Pool 2

A.2 Effects of Past Year's Water Levels

Levels:

Water levels generally followed the planned water levels.

Results:

Cattail and river bulrush dominated the unit. Other higher areas had good growth of submergents and emergents. The section towards the back gate had good stands of smartweed. Southern portions were wet meadow habitat.

Facilities:

All facilities are maintained by Davis Besse staff. Brush encroachment on the dikes is making censusing difficult as well as damaging the dikes. The staff gauge was surveyed and seemed to be off (as compared to the bench mark). It should be resurveyed and corrected.

Costs:

All pumping costs were covered by Toledo Edison. No purple loosestrife plants were observed.

B.2 Objectives of 1991 Proposed Water Levels

Water levels should be maintained during nesting season and kept moderate to high to open up the cattail. Some water should be taken off in the summer to increase invertebrates. Then water should be added for fall migration.

9. Purple Loosestrife: None observed.

Navarre - Pool 3

A.2 Effects of Past Year's Water Levels

Levels:

Water levels were maintained well below the planned levels. Base information needs to be gathered. The unit needs to be measured to determine depths at certain gage readings.

Results:

Cattail is the dominate species in this unit. Muskrat are using the area extensively. Many Coots used the pool for nesting. Other waterfowl noted in the area were few.

Facilities:

All facilities are maintained by Davis Besse staff. Brush encroachment on the dikes is making censusing difficult as well as damaging the dikes. Flap gates were installed by Davis Besse staff on the outer dike near the mouth of the river. A staff gauge was surveyed and placed near the pump station by refuge staff.

Costs:

All pumping costs and the flap gate costs were covered by Toledo Edison. No purple loosestrife was observed.

B.2 Objectives of 1991 Proposed Water Levels

Water levels should be raised slightly before nesting season. Then kept constant during nesting. A small amount of water should be released midsummer to encourage emergents. Then water levels should be raised for fall migration. The unit needs to be analyzed for base data such as maximum elevation possible, flowline of lowest structure and average depths at set elevations.

